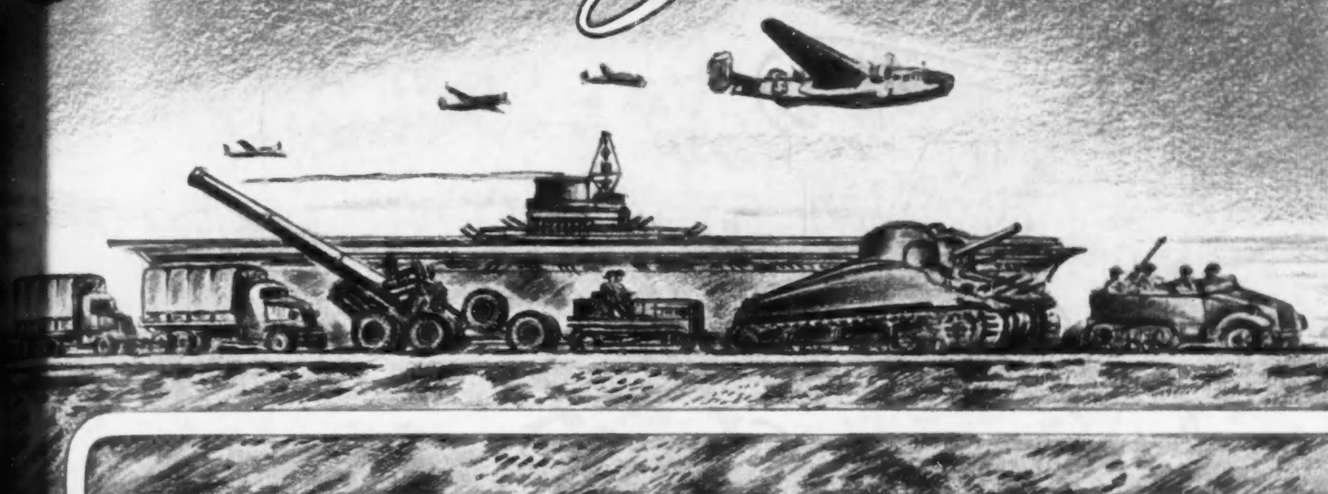
S·A·E Journal



FEBRUARY 1945

SOCIETY OF AUTOMOTIVE ENGINEERS

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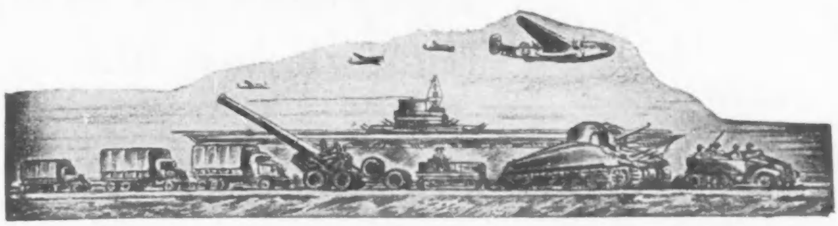

News of the
MARCH
Issue

By Norman G. Shidle

Momentum

MOMENTUM and inertia tend to produce identical effects when applied to human minds and actions. One man fails to move readily in accomplishment of new projects because he is too lazy or indifferent to get started. Inertia bogs him down. Another fails in exactly the same way because he can't stop doing the things which habit has made routine for him. Momentum in a single direction prevents action in fresh fields just as effectively as inertia itself.

More men fail of high achievement because the momentum of habit drives their lives along a given course than because they fail to move at all. People who have great momentum are less likely, than those who remain at rest, to sense the fact that they may not be going anywhere. The very whirr of continued motion tends to deafen the mind to calls for change of direction. It can happen to the best of men.

Momentum is insidious, too. It rings no bell to warn that it is about to take control of a life which, previously, directed its own course. The momentum of our social and economic lives accumulates gradually. We don't always see momentum's subtle change to a Frankenstein before we have become its slaves instead of its master.

A speeding automobile out of control of its driver leads to tragedy no more frequently than does a life out of control of the man who is living it.

Industry Ready To Build Planes For Post-War Flying Generation

EVIDENCE accumulates that World War II is quickening the evolutionary process of freeing the airplane from its functional cocoon. Human flight, albeit mechanically contrived, seems to be doffing the aura of adventure and to be donning utilitarian aspects.

Post war, the public may take en masse to the air and rift the clouds with flocks of flying flivvers. On the other hand, the public may be content to view flying merely as aerial yachting, or as a medium for commercial transportation to be used when speed is a top factor. Choosing between these possibilities is a privilege to which, whatever happens, no penalties attach.

As will be pointed out in March *SAE Journal* by A. G. Tsongas and F. S. Macomber, of Stinson Division, Consolidated Vultee Aircraft Corp., the war has put the aircraft industry in favorable position to meet any demand and even to influence trends. They will suggest that the war has given the industry considerable experience with high-production techniques. Also, the war is making the post-war generation air-minded. And large-scale manufacture of low-cost airplanes, it will be their stated opinion, looms on the horizon.

Cloud on that horizon, they will say, is the problem of cost-planning post-war aircraft. The authors will present a detailed plan for converting the prototype plane, satisfactory as regards performance, comfort, safety, and market acceptance, into a production design that will be as low in cost as it is humanly possible to make it. The proposed solution will include the making of a detailed cost analysis, not only of one design, but of all likely designs, comparing estimated cost per pound with similar parts made in the past, and following up to see that the low-cost ideas built into the ship are used through the tooling and manufacturing phases of production.

Design, Service, and Efficiency Determine Forced Cooling Needs

WHEN – and whether – to install forced cooling in airplanes is becoming a matter of engineering judgment which requires thorough consideration of the numerous factors involved, plus calculation of potential percentage efficiencies.

Forced cooling is not always essential, J. H. Brewster III, of Research Division, United Aircraft Corp., will say in March *SAE Journal*, but customarily is needed for satisfactory performance at altitudes exceeding 25,000 ft, for low indicated airplane climbing and cruising speeds, and, under certain conditions, it may allow a substantial increase in gross weight of transport planes, whose gross weight is limited by single-engine ceiling (by regulations).

Mr. Brewster will come to the conclusion that forced cooling, and fan cooling in particular, need not be considered necessary if engine, radiator, and installation development are far enough advanced. At present some installations require forced cooling – others do not.

Tire Repairing Is Accelerated By Electronics

TIRE-vulcanizing by electronic principles appears to be a post-war process which is getting off to a running start in wartime.

The process, as currently developed, promises to reduce operating time to minutes and to effect, without scorching or otherwise deleteriously treating the rest of the tire, a repair so lively and satisfactory that the service life of post-war tires is discussed in terms of 100,000 miles.

The process and the machine employed will be described in March *SAE Journal* by Col. C. W. Vogt, chief, Technical Staff, Office of the Chief of Transportation. Briefly, the machine will be said to consist of a press ram equipped with an electrode coupled to a high-frequency generator, and a press frame. Ram and frame are fitted with filler bags which adjust themselves under pressure to tire contours.

Col. Vogt will explain that "internal heat" makes spot and sectional cures, within as short a period as 10 min, on any size tire without using molds. He will suggest the possibility of applying the process to tire recapping and manufacturing operations after the war.

"Sonigage" Checks Section Thickness By Surface Contact

MEASURING the section thickness of modern aircraft structures after final machining, a task essential to determining operating strength and safety factors, has been facilitated by development of the "sonigage," a device which reliably indicates thickness through surface contact.

Secret of the "sonigage" is the excitation of supersonic vibrations, Wesley E. Erwin, of Research Laboratories Division, General Motors Corp., will explain in March *SAE Journal*. Section thickness is revealed by the directly related frequency at which the metal is set in resonant vibration.

The device consists of a simple variable-frequency electronic oscillator and a quartz crystal for converting this electrical energy into mechanical vibrations. In operation, the crystal is brought into contact with the metal, and the oscillator is tuned to the metal's resonant frequency as indicated by a power output meter. Tuning so sharp as to indicate changes of as little as 1% makes accurate thickness measurements readily feasible.

Mr. Erwin will report that no particular skill is required to operate the "sonigage," and that it is so accurate as to hold maximum errors to less than 2% within the approximate range of 0.020 in. to 0.400 in. in the thickness of metal.

AIRCRAFT EXCELLING BIRDS IN TECHNIQUE OF MAKING LANDINGS

SCOFFERS inclined to annoy aeronautical engineers with reminders that birds seem to experience no difficulties in landing at high speeds are getting a sobering answer these days. Birds do not have to solve the problem of safely landing at three-figure speeds rigid bodies measured in six-figure weights.

The engineers profess to admire both the flying and landing abilities of the birds. In fact, they say that even lacking the guidance of the fabulous roc, the only bird approximating the plane in size and weight, they have learned much from their smaller feathered friends, particularly in the way of basic principles of retraction, energy absorption, mechanical linkage, and minimum weight.

In this connection, March *SAE Journal* will present, in the words of Roy W. Brown, of Firestone Tire & Rubber Co., an outline of the landing-gear problems both of present planes and of prospective 200,000,- to 300,000-lb jobs – bigger than any roc.

Mr. Brown will suggest landing gears the birds never have used – interchangeable eight-wheel articulated undercarriage units retracting between floor beams. For the smaller ships, Mr. Brown will propose suspensions combining the advantages of air springs, rubber springs, friction material, and oil absorption.

Boost Engine Output for Swift Post-War Highway Travel Tempo

POPULAR concept of a 60-hr, air-minded, post-war world evidently may be accepted as indication of expected acceleration in travel tempo on land as well as in the air when the war ends. Engineering talk is of more powerful, more agile, and much faster motor vehicles to meet the requirements, up hill and down, of minimum speed laws on marvelously improved highways.

At least, that is the talk of engineers who, charting 40 years of progress in motor vehicle design and performance, extend the curves into the future, allow for a wartime speedup in technological developments, and come out with an amazing picture of a quickened tomorrow. Highlighted are engines developing 165 bmep, unsupercharged, and 200 bmep, supercharged, producing in the unsupercharged version something like 1 hp for every 1¾ cu in., bulking no larger than current models, costing less in dollars per horsepower, and capable of propelling vehicles at speeds which really are high.

Some of these prognostications will be documented in March *SAE Journal* by F. S. Baster, of The White Motor Co. Mr. Baster will base his predictions on the belief that intelligent engineering will be as potent an influence for progress as high-octane fuels. He will cite possibilities of improving engine performance, even on present gasolines, by increasing compression ratios, applying electronic principles to spark timing, devising new ignition systems, using new materials, and benefiting from aircraft-engine experience.

Sludge Formation Bedevils Wartime Highway Transport

SERIOUS concern, particularly on the part of operators of commercial motor vehicles striving to maintain wartime transportation schedules, is with preventing the formation of sludges and the resulting unfortunate effects upon the engines of irreplaceable vehicles. Formation of sludges, both the hot-engine and the cold-engine varieties, seems to have reached epidemic proportions and to bedevil those having the responsibility of keeping the wheels rolling over the roads.

Various recommendations for the prevention of hot-engine sludges have been made, among them application of oil filters, adequate temperature control, frequent crankcase draining, and use only of heavy-duty oils. Efficacy of these various recommendations will be described in detail in March *SAE Journal* by H. C. Mougey, of Research Laboratories Division, General Motors Corp.

Aircraft Uses Give Bevel Gears Severe And Thorough Tests

TOUGHEST jobs yet assigned to bevel gears are the multiple and special requirements attending their use in aircraft. Ubiquitous other applications put bevel gears to real tests, but pose few of the serious problems of aircraft applications, which include questionable lubrication, variously mounted mating parts, extreme ranges of temperature, and plain bearings.

Still bevel gears not only can meet requirements, but approach the 98% efficiency bracket, L. J. O'Brien, of Gleason Works, will say in March *SAE Journal*. Reviewing aircraft applications, Mr. O'Brien will stress the need for care and thought, from original design to final use, and including processes such as grinding.

Vehicle Operation Improved by Match of Engines, Fuels

ENGINEERING progress, seldom spectacular but tremendously helpful, is being made in the field of developing the most effective combinations of engines and fuels. Such undertakings, reaching new highs in cooperation between engineers and refiners, promise virtually unlimited future benefits both to public and trade.

Interesting phase of this activity is the work of the Automotive Diesel Fuels Division of the Coordinating Research Council's Coordinating Fuel Research Committee. Initiated more than four years ago, currently it is directed to ascertaining the effects upon engine performance of such individual fuel characteristics as ignition quality, viscosity, and voltatility.

These studies, carried on in separate laboratories with engines of different design, have been concerned particularly with the relationship between these fuel characteristics and engine deposits, odor and lachrymation, low-temperature starting, power output, fuel consumption, exhaust cleanliness, and engine smoothness.

Findings, conclusions, and recommendations will be presented in March *SAE Journal* by F. C. Burk, of The Atlantic Refining Co.; G. H. Cloud, of Standard Oil Development Co.; and W. F. Aug, of Mack Mfg. Corp. The data, which have been accumulated from studies of substantially independent effects of ignition quality, viscosity, and volatility and which have permitted of preparation of a diesel fuels classification table, will be reported to indicate that:

- Cetane numbers are of importance in engine starting, combustion roughness, misfiring, and varnish formation.
- Fuel viscosity cannot be divorced from volatility in normal fuels.
- For practical purposes, the API gravity can be taken as the measure of a fuel's heating value.

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FEBRUARY 1945

WAR ENGINEERING SERVICE

S PLEDGED ANEW AT AE'S 1945 ANNUAL EETING IN DETROIT

Left to right: SAE 1945 President J. M. Crawford; Toastmaster Eugene E. Wilson, vice-chairman, United Aircraft Corp.; and SAE 1944 President W. S. James

HE pattern of war engineering service rendered by the automo- ve industry in producing the sources f cheap and effective power for ver- tile applications further was color- lly etched at the SAE 1945 Annual leeting. New and broader vistas of e technical world to come were pened.

The meeting produced copious evi- ence that automotive engineering as reached a new threshold opening pon tremendous technical develop- ents, possibly upon a global scale hich presages international competi- ion and continuing demands upon he SAE to maintain for America orld aircraft and vehicle engineer- ng leadership.

More than ever before emphasis as placed upon cooperation between ndustries built about the internal ombustion engine, and the necessity or viewing their products, whether ngines, vehicles, or fuel, as compo- ent and equally important parts of the overall pattern of service.

These post-war panoramas formed a background for extended discussion of current war engineering needs, and for pledges that SAE would carry on its broad war engineering program already dedicated to victory.

Continued Engineering Services Pledged by President Crawford

Delivering his inaugural address before nearly 1800 SAE members and guests attending the War Engineering Dinner, SAE 1945 President J. M. Crawford pledged continued and increased cooperation between the automotive industry and the armed forces, with SAE committees functioning in liaison, and as coordinated groups of highly trained experts to help the Army and Navy to keep combat equipment always modern.

President Crawford proposed the setting up of machinery for periodic reviews of military requirements, of the availability of materials and production facilities, and of commercial designs of transportation equipment and engines with the stated object of eliminating any necessity for haste in developing new processes, materials, and designs.

"It is in this area," he declared, "that SAE has done its most effective work during the war, and can continue to be of maximum service to industry and the armed forces in the post-war period."

Brig.-Gen. F. O. Carroll, chief, Engineering Division, Air Technical Service Command, Wright Field, was the chief speaker at the dinner. His Topic: development of the U. S. Army Air Forces

Wilson Stresses Need of Technical Resources

The factor of international competition in the field of technology was

stressed by Toastmaster Eugene E. Wilson, who declared it would play an increasingly important part in the rise and fall of peoples and of nations.

"We will need every resource at our command to keep the peace of the world," asserted Mr. Wilson. "Every technical agency, whether in industry, in private educational institutions, in foundations, or in government, must contribute to our continued technical leadership. Of all these, competitive private industry has proved the most productive. Its creative force is enormous. The other agencies are auxiliary to it. Its initiative must be preserved.

"The SAE has, for many years, coordinated these agencies in the public interest. It has a proud record of achievement and deserves the thanks of the people. But in the period ahead it faces an even greater challenge. The officers of the Society have a heavy responsibility."

Gen. Carroll Says Research Is "Aviation Insurance"

From Brig.-Gen. F. O. Carroll, chief, Engineering Division, Air Technical Service Command, came the stated opinion that "research is our aviation insurance; we dare not let a single premium lapse.

"Every day reveals new scientific possibilities," Gen. Carroll said. "Through research new developments are cascading one after another. We have built up what might be called 'research momentum.'"

James Lauds Cooperation

SAE 1944 President W. S. James expressed his appreciation of the fraternal spirit prevailing in the SAE as not only encouraging the pooling of talents and the accomplishment of great purposes, but as a service which accorded him the fullest measure of support throughout his term as president of the Society.

Signalizing contributions to technological progress, the 1944 Daniel Guggenheim Medal was presented to President Lawrence D. Bell, of Bell Aircraft Corp. In receiving the award, Mr. Bell stated that we are on the threshold of aviation progress that will accomplish performances undreamed of a few years ago, and that "in further development of airpower lies our greatest hope for national security and permanent peace."

An SAE life membership was presented to SAE Past-President A. W. Herrington, of Marmon Herrington Co.

Bell Given 1944 Medal of Guggenheim Foundation

Lawrence D. Bell (left) as he received the 1944 Daniel Guggenheim Medal for outstanding achievement in aeronautics from Past-President Mac Short, who represented the Medal Board of Award, at the Annual Dinner

LAWRENCE D. BELL, president, Bell Aircraft Corp., received the Daniel Guggenheim Medal for 1944 in a presentation made by Mac Short, SAE member of the Guggenheim Medal Board of Award at the 1944 SAE War Engineering Annual Meeting Dinner. The award to Mr. Bell was "for achievement in design and production of military aircraft."

Created to honor those making notable achievements in the advancement of aeronautics, the Guggenheim Medal is awarded annually. It is financed by a fund provided in 1928 from the Daniel Guggenheim Fund for the Promotion of Aeronautics. This Medal Fund is administered by nine representatives, three appointed by each of the following: the American Society of Mechanical Engineers, the SAE, and the Institute of Aeronautical Sciences. Presentation of the Medal is usually made before one or the other of these Societies, three previous awards at SAE gatherings having been to Frederick W. Lanchester in 1931, to Dr. Jerome C. Hunsaker in 1933, and to William F. Durand in 1935.

SAE members of the Board of Award are William Littlewood, Mr. Short, and George A. Page, Jr. Dr. George W. Lewis is Chairman of the Board.

Virtually every session of the five-day annual meeting attracted a capacity audience. Total registration exceeded 3200. Speakers held the interest of their hearers to the final word and then yielded to discussers, ranging the gamut of automotive engineering topics.

Student Session

New frontiers being opened up daily by scientists and engineers may be the pitfall of our civilization unless everyone is willing to make personal, social and emotional readjustments, a science editor told a large audience of junior automotive engineers at a student session held by the Detroit Section.

"We must not assume that mass production is the only key to a better civilization. It simply improves one aspect of our economics. In so doing the standard of living imbalance between countries will tend to be worse and this will always be an international irritant," it was pointed out.

The technique of ultra-high-speed moving picture photography of mechanical motion was described by two other engineers as a new and effective tool in design improvement.

Future Fuels Previewed, Lube Topics Investigated

. . . at F & L Sessions

PROMISING new horizon in the field of power production by internal combustion engines was limned at Fuels & Lubricants Sessions with the revelation that a new fuel, trimethyl butane, or triptane, presages future liberation from detonation difficulties and the possibility of developing new concepts of engines to take advantage of a fuel productive of power limited only by power-plant capacities.

This fuel, now produced experimentally at a cost of $35 per gal, was characterized as a highly-satisfactory agent which, blended with gasolines in the range of 20 to 60%, would produce eight times the power avail-

turn to p. 20

Prominent guests gathered at SAE's Annual Meeting (reading from left to right) included:

1. Flight/Lt. Douglas G. Moffitt, RAF, British Air Commission; Dr. Edward Warner, vice-chairman, Civil Aeronautics Board; Dr. Jerome C. Hunsaker, chairman, National Advisory Committee for Aeronautics.

2. Com. O. E. Szekely, production manager, Naval Aircraft Factory; Capt. R. Velz, chief inspector, Navy Materiel; Capt. C. M. Huntington, manager, Naval Aircraft Factory; Col. J. M. Colby and Col. J. H. Frye, Office of the Chief of Ordnance.

3. Frank R. Fageol, president and board chairman, Twin Coach Co.; George T. Christopher, president, Packard Motor Car Co.

4. Henry Ford II, executive vice-president, Ford Motor Co.; Carl Breer, director of research, Chrysler Corp.

5. O. E. Hunt, executive vice-president, General Motors Corp.; Lt.-Col. G. R. Gaillard, A-N Aeronautical Board.

6. J. W. Frazer, chairman of the board, Graham-Paige Motors Corp.; George W. Mason, president, Nash-Kelvinator Corp.; Irving B. Babcock, president, Aviation Corp.; A. W. Herrington, chairman of the board, Marmon-Herrington Co.

7. R. J. Woods, chief design engineer, Bell Aircraft Corp.; J. Carlton Ward, Jr., president, Fairchild Engine & Airplane Corp.; R. N. DuBois, Packard Motor Car Co.; chairman, SAE Detroit Section.

able from 60-octane gasoline and approach 875 imep. Imminence of engines approximating 40 to 45% in efficiency, with explosion pressures of 2000 psi, was suggested.

Opinion was expressed that engineers, rid of detonation shackles, now have opportunity limited only by imagination to develop the best combination of engine and fuel to give the greatest value per dollar and thereby to produce the most power at the least cost from every pound of fuel.

Triptane, described as a fuel with a definite boiling point sharply and qualitatively separated by methods now shrouded in military secrecy, was said to be the third significant development in the series which began with tetraethyl lead and progressed through the diesel engine. Triptane was said, in combination with tetraethyl lead, to produce as much as four times the power obtainable from 100-octane gasoline and to reduce fuel consumption by as much as 25%. It was suggested that while, from now on, engineers may be concerned less with the fuel than with the type of engine to design and to build, triptane affords such high power-production capabilities that even decision as to the type of engine tends to border upon the academic. It was added that the use of triptane in internal-combustion engines has produced such results as to divert attention from turbine and jet propulsion plants, particularly since power production now appears to be limited only by the ability of engineers to design and to build engines which can withstand the terrific explosion pressures developed by the new fuel.

The problem of producing power by internal combustion engines was defined as that of developing the most and cheapest power from a pound of fuel irrespective of what form the engine may take. Use of triptane was said to be a direct route to development of the best combination of engine and fuels, particularly since it will permit the use of higher compression ratios – currently mentioned as 10 to 1 and 12 to 1 – and thereby will increase thermodynamic efficiency and produce much more work per pound of fuel.

Other reports presented at Fuels & Lubricants Sessions stressed the fact that not only fuels, but lubricants have been improved through accelerated wartime experimental work. Outstanding result was cited as the development of anti-foaming additives for lubricants. These were said to have eliminated all difficulties the military had been experiencing with foaming and have corrected the troubles before it was necessary to use motorized equipment in any theater of war.

Early and continuing work of the Coordinating Research Council was commended as being of tremendous aid to the military, first in overcoming such difficulties as were created by oil foaming, then in enabling Ordnance to prepare fuels and lubricants specifications which are sound and useful, additionally in developing practical test methods and, finally, in coordinating the knowledge and technical skill of the automotive and petroleum industries for the solution of new and continuing fuels and lubricants problems developing and changing with virtually every new theater of war.

Essentiality of petroleum fuels and lubricants to fully mechanized war repeatedly was stressed in technical papers which described how lubricants are being "tailored" to meet specific war needs. Not only foam inhibitors, but anti-oxidants, detergents, and pour depressants were reported to have been provided for military purposes. These additives, primarily finding use for "quick-fixes" tremendously time-saving over design modifications, were said effectively to provide special functional qualities and to facilitate both the continued and the more satisfactory operation of equipment.

The foam inhibitors, it was explained, ended serious foaming difficulties threatening to damage certain aircraft engines, Navy diesels, and Army tank engines and gears. Antifoam additives developed through the work of the CRC Coordinating Lubricants Research Committee were said to maintain their helpful action even beyond the useful life of the oil and to work no adverse effects upon the functional properties of lubricants.

Equally important contribution was reported as the preparation for the military of universal gear oil specifications defining lubricants in terms of what they will do. Work of CRC Lubricants Advisory Group in cooperation with Ordnance, was said to have resulted in the accumulation of data on performance properties of an entire series of experimental lubricants under field operating conditions, and in the preparation of specifications which emphasize performance under high speed shock conditions and, in effect, define satisfactory hypoid gear lubricants almost entirely in terms of laboratory tests.

Exhaustive discussion at the crowded Fuels & Lubricants Sessions developed controversy over such questions as whether road or laboratory tests are more satisfactory for gear lubricants. The SAE test machine was commended as providing, except for churning, every aspect of road tests, plus the helpful factor of reproducibility. On the other hand, the machine was criticized as being too simple in design and action and less effective than the dynamometer in simulating road tests on actual equipment with which the lubricants are to be used.

Subjection of samples of proposed universal gear lubricants to tests aggregating more than 1,000,000 miles on the road, and in the laboratory, were said to have revealed that the controversy is logical. It was explained that some laboratory tests show the best values for the poorest lubricants, and that the test problem is difficult particularly because lubricants which pass high speed and torque tests may fail at low speed and torque, and that various combinations of qualities are disclosed.

Further aid to the military in developing and obtaining satisfactory fuels and lubricants was said to have resulted from steps to improve the reproducibility of the L-4 Oxidation Engine Test Procedure. Characterized as especially helpful were two new reference oils – R. E. O. 6, which has a borderline, or low, rating, and R. E. O. 7, an oil of high rating; highly uniform piston rings of both oil and compression types; and clarified test procedure details.

FUELS & LUBRICANTS SESSIONS

Gear lubricants, oil foaming, a new oxidation engine test, and fuels contributing to higher power and efficiency are bright points of the two fuels and lubricants sessions.

W. G. AINSLEY, Chairman, Fuels & Lubricants Activity Meetings Committee

"Universal Gear Lubricants," by P. V. KEYSER, JR., Socony - Vacuum Oil Co., Inc., "Engine Oil Foaming," by H. A. AMBROSE and C. E. TRAUTMAN, Gulf Research and Development Co., and "L-4 Oxidation Engine Test," by B. E. SIBLEY, Continental Oil Co., were presented when SAE F&L Vice-President J. R. SABINA presided. A. T. COLWELL was chairman when "Fuels and Engines for Higher Power and Better Efficiency," by C F. KETTERING, General Motors Research Laboratories Div., was presented.

War Progress Theme Stressed in Papers

. . . at Materials Sessions

EXPERIENCES gained from wartime developments and uses of materials may open up entirely new fields for their application in the post-war transportation industry, engineers were told at the Materials Sessions of the 1945 SAE War Engineering-Annual Meeting, where the combined views of metallurgists, industrial designers and rubber experts presented a picture of tireless research and ingenuity in discovering substitutes for shortages of high-priority goods.

All papers presented at this SAE War Engineering-Annual Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

War needs have not only produced new materials in the form of synthetics, it was pointed out; they have also placed extreme importance upon the selection of such necessary items as steel and magnesium to meet the urgent delivery dates and maximum service requirements incurred by high-speed production. While it was emphasized that use requirements, design factors, manufacturing facilities, production speed and adequacy for the completed job preclude reli-

MATERIALS SESSIONS

Two materials sessions focused attention on the new SAE rubber classification program, wartime fabric developments, enemy metallurgy, and steel.

W. H. GRAVES,
Chairman, Engineering Materials Meetings Committee

W. M. PHILLIPS was chairman of the first session, which offered "SAE Rubber Classification and Its Uses," by W. J. McCORTNEY, Chrysler Corp., and "Wartime Fabric Developments of Significance to the Automotive Industry," by MORRIS SANDERS, industrial consultant and architect. At the second session, under the chairmanship of R. W. ROUSH, were presented: "Metallurgy of Enemy Automotive Materiel," by COL. J. H. FRYE, Office of Chief of Ordnance, and "Some Cases for Steel as a Material," by E. P. STROTHMAN, A. O. Smith Corp.

...e upon any one supposedly superior material, low-alloy steel was agreed to have many ...orable characteristics.

Proof of this was given in a story of the ...9 bomber nose frame, originally cast ...m magnesium – an operation which called ... the use of 3000 to 5000 lb of sand to ...duce a 38-lb structure and which could ...t be completed with sufficient speed and ...ntrol to meet delivery dates. By substi...ting a welded low-alloy steel structure, it ...s found possible to increase yield strength ...ht times, and to produce the frame much ...ter and more cheaply than before. Other ...amples cited showed again how low-alloy ...el as a pinch-hitter saved considerable ...ight and materials in landing gears of the ...47 and B-24 planes.

Rubber also came in for its share of con...deration with a description of the behind-the-scenes effort to standardize synthetic rub...ber compounds when the scarcity of the ...tural product became apparent. Those ...gineers in the SAE, ASME, and the Army, ...ho were faced with the difficult task of ...assifying countless compounds so that they ...uld be usable for combat purposes were ...ghly praised for their vast contribution to ...e war effort.

The SAE-ASTM Technical Committee A, ...ganized in 1939 to establish uniform syn...thetic rubber specifications, had only the ...eel standards as an index for the way the ...b was to be done. Today, SAE classifica...tion rubber was reported as being used for ...ore than 75% of automotive, aeronautical ...d general mechanical goods as well as for ...n belts, brake cups, and rubber composi...tion gaskets.

Embarking on a post-war prediction spree, ...e engineer forecast that synthetic mate...rials which are now getting maximum tests ...n warplanes and equipment, will lead in ...ture automotive interior decoration. Syn...thetics such as vinylidene chloride, sheet ...inyl, cellulose acetate, fiberglas, rayon and ...ylon have been so perfected that they will ...rovide upholstery which is bright in ap...pearance, resistant to wear, and easy to ...ean, it was stated.

Test results were cited as proof that fabric-...based rigid laminates for vehicle bodies ...ore enduring and decorative than anything before available will be possible – and that it will be no unusual sight to see plaid-surfaced station wagons, florists' trucks resplendent in floral designs, and motor buses with ceilings opaque by day and translucent by night. Such attractive prophecies were substantiated by vividly-colored photographs showing the varied military and civilian uses to which synthetics have already been put and which illustrated the utility value of these materials.

Enthusiasm which greeted these remarks was dimmed only by the warning that the Nazis are advancing along with Americans in improvements of material and materiel. German weapons were characterized as "good and getting better" – and their steel-producing capacity was rated as still being second only to that of the United States, with peak production of plus 50,000,000 tons yearly probably reduced to about 35,000,000 tons by bombing, labor difficulties, and loss of the resources of liberated countries.

While there is not so much competition from the Japanese – whose materiel was described as static, inferior and unimaginative, and whose steel capacity was rated at a peak of 15,000,000 tons probably reduced to 11,000,000 by bombings – data supplied by the Army indicated that American industry is continuing in its progress of increasing the efficiency of its materials . . . for war and for peace.

War, Future Standards Reviewed and Projected

. . . at Passenger Car and P. C. Body Sessions

ORDNANCE Department insistence that American tanks have greater firepower, more armor protection, higher maneuverability, and greater reliability than any other tanks of comparable weight in the world was an outstanding feature of the sessions arranged under Passenger Car auspices.

PASSENGER-CAR BODY SESSION

"The Practical Post-War Car" formed the topic for a symposium based on consumer reaction to present automobile bodies.

R. I. SCHONITZER,
Chairman, Passenger Car Body Activity Meetings Committee

Mr. Schonitzer was chairman of the session when reports from BERT PIERCE, *New York Times*, New York; HERBERT D. WILSON, *Herald-American*, Chicago; GORDON HEBERT, *Times-Picayune*, New Orleans, and JOHN BURKE, *San Francisco Examiner*, San Francisco, thoroughly covered the subject of the Post-War Car.

The German Tiger and King Tiger tanks, with their 64 and 74 tons weight, do carry a larger gun and heavier armor than does our Medium Tank M4, it was admitted, but the decision of our Army Ground Forces not to use the completely developed 62-ton M6 Tank in European theaters was praised with the comment that "to them a tank represents mobile firepower – something to fight from, not to hide in." In a break-through, it was shown, an equivalent weight of M4s to Tigers or King Tigers can cover two roads, go twice as fast, and have twice the mileage range for a given quantity of fuel . . . and such feats were accomplished. The lumbering Tigers, it was pointed out, are at their best in fighting a defensive war with short lines of communications as the Germans now are doing.

Top billing went to discussions bearing on war problems of both the military and civilian fronts at the Passenger Car and Passenger Car Body sessions, although side

PASSENGER-CAR SESSIONS

Future possibilities of standardization, synthetic rubber, long-time ownership of cars, and industry-Ordnance cooperation, were the topics that held the attention of the audience attending the three Passenger - Car sessions.

K. M. WISE,
Chairman, Passenger Car Activity Meetings Committee

Papers on "The Future of Standardization in the Automotive Industry," by J. H. HUNT, General Motors Corp., "The Future of Standardization in the Aeronautical Industry," by ARTHUR NUTT, Packard Motor Car Co., Toledo Div., "Synthetic Rubber in Automotive Chassis — Status and Future Possibilities," by E. F. RIESING, Firestone Industrial Products Co., were given at the Session presided over by J. E. HALE. "Difficulties of Long-Time Ownership of Passenger Cars," by JOHN OSWALD, General Motors Corp., was given at the sessions led by SAE Passenger-Car Vice-President E. H. SMITH. "Contributions of Industry to Ordnance Tank-Automotive Engineering," by COL. JOSEPH M. COLBY, Office of Chief of Ordnance, was presented at a session presided over by J. G. WOOD.

STANDARDS SESSION

A joint session organized by ASME, Detroit Section, and SAE, presented a new code system for drawing offices.

Under the chairmanship of E. J. BRYANT, C. A. GLADMAN, National Physical Laboratories, England, gave a paper entitled, "Drawing Office Practice in Relation to Interchangeable Components."

glances were taken at the registered desires of the public as regards post-war automobiles and the continuing effects after the war in both civilian and military areas of current developments in the automotive standards and synthetic rubber pictures.

Military spokesmen made clear in these discussions that engineering mistakes can be just as fatal in this war as tactical errors, and saluted the teamwork achieved by automotive engineers and Ordnance, largely under SAE auspices, as "the finest expression of the working of an intelligent democracy."

Data brought before the audience of engineers currently engaged solely on war jobs revealed the status of important military vehicle development work as a basis for the continuing cooperative effort demanded.

Information presented, for example, showed that, of the American track-laying combat vehicles now being produced, all but two have been developed in the past two and one-half years. The remaining two, fast becoming obsolete, will soon be replaced with new equipment now in the final development stages.

The ideal power-weight ratio of 20 hp per ton for tank engines has already been achieved, it appears, in our 76-mm gun motor carriage and the airborne tank, but is not yet practicable on heavier units.

The conversion to synthetic rubber, it was divulged, has gone a very long way. All jeep tires have been made of synthetic rubber for two years; 90% of the Army's biggest volume sizes (7.50 and 9.00) is now synthetic; the small volume 10.00 through 12.00 sizes are in full production 70% synthetic; very large earth-mover tires are 35-50% synthetic; all inner tubes are synthetic; and rubber track blocks and bogie tires for track-laying vehicles are 65% converted.

Disclosed at another session were advances made toward permitting accurate specification of these synthetic rubbers which have made possible such successful military as well as constantly increasing civilian vehicle applications. Plotting of synthetic characteristics at a variety of temperatures, it was shown, clearly proves that room temperature property study alone (the conventional method) does not permit anything like complete evaluation of existing synthetic elastomers. Resiliency values of compounds at specified temperatures should be a "must-know," it was urged, before final details and specifications are released for any design. Properly applied to designs, synthetics were shown to outperform natural rubber under numerous conditions of temperature and oil-resistance requirements.

Standards on the March

Interrelationship of all phases of automotive standardization work was dramatically illustrated by several discussions.

Continued movement toward greater standardization and simplification of military vehicle elements appears certain in the light of Army views, stated at this meeting, although some of the Army's ultimate desires will be difficult if not impossible of full realization. The military men would like, for instance, to have a series of tank engines with a standard cylinder, but technological advances, not only in reciprocating engines, but in other fields, may never permit this ideal to be reached. Nevertheless, standardization which simplifies procurement, training, supply and maintenance is growing steadily. On new development, however, where there is time for tooling of factories, Ordnance is requiring conformity to its book of standards.

Predictions about future development of SAE standards, the pre-war existence of which has helped speed military production in a multitude of cases, visioned later revision of the NE steel specifications in the development of which SAE played an important part; SAE supply of engineering information and cooperation with other organizations in working out such consumer standards as may be required; continued revision of existing SAE standards to keep them in line with future civilian and military requirements; and gradual development of new standards as required by new materials, processes and procedures. Radically new standards were not seen as products of the near future, although it was indicated that accelerated wartime experience with some modified material specifications may justify their use for early peacetime production and become of such general application as to deserve standardization. The real reason for the use of standards is economic, it was stressed; that is, to obtain a desired or necessary result at a minimum overall cost.

The acceleration which war has given to aeronautical standards work was emphasized, as was the importance of continuing such efforts through the next era of peace as a matter of military importance, as well as for the contribution possible in connection with civil aviation. SAE aeronautical standardization activities, it was pointed out, have been developed on the policy that the Society should be equipped to sponsor development of industry standards and to advise on technical problems of broad industrial concern.

An international tinge was given to both military and civilian phases of the standardization discussions by a detailed description of work on drawing office practice in relation to interchangeable components completed recently by a special Service Committee set up by the British admiralty, for the purpose of standardizing drawing office practice in certain of their design departments.

Considerable discussion following presentation of this material indicated widespread interest in the possibilities suggested and the probability of further detailed study by many individual engineers.

Car Troubles in Wartime

The importance of maintaining civilian car reliability in wartime, when replenishment of the dwindling new car pool is impossible, centered attention at one session on technical problems of the wartime car owner. Appraisal of special troubles which now are developing in quantity indicated high ranking for malfunctioning door locks and window regulators; electric systems depleted in efficiency, front tire wear, excessive oil consumption, need for frequent cleaning and replacing of spark-plugs, vastly increased corrosion difficulties on many parts of the car body – *and mufflers.*

Lack of public realization of corrosion dangers was posited as one major cause for prevalence of this phenomenon, while better positioning of such units as mufflers and emergency brakes for rust resistance was suggested by some as an alleviation for the problem.

What Public Wants – Post-War

Word from an articulate section of the American public on what it wants in post-war automobiles comprised the only specifically after-peace discussion in this group. Gained through surveys made by four of the nation's leading newspaper automobile editors, the consensus showed – with some variation due to sectional differences – popular demand for:

Four-door sedans; wider, more comfortable seats, adjustable up and down as well as fore and aft; more headroom; three-passenger front seats; radios, clocks, and cigarette lighters which are reliable and conveniently located; more adequate soundproofing; better vision all around; simple, durable upholstery; less chromium trimming; narrower fenders; streamlining, but not at the expense of room and comfort.

Standardized bumper heights are generally desired – as are body finishes which hold up and look well over long periods of time.

Engineers at the meeting commenting on these reports from the public saw particular significance in the strong desires expressed for better vision and indicated definite possibilities for improvement in this respect in post-war cars.

Water-Alcohol Injection, Power Brakes Are Studied

... at T & B Sessions

HOW earlier fundamental research has been applied to specific war projects and to evaluation of war results in terms of post-war applications was graphically demonstrated at the two Truck and Bus Sessions. Special emphasis was laid on the post-war possibilities of water-alcohol injection for spark-ignition engines and power-braking. In both instances, war utilization of long-known research facts was credited with engineering interest in future potentialities.

Prediction that water-alcohol injections will have greatly increased use after the war – despite the fact that their effects are

not yet fully understood – was one highlight of the meeting. Extended and practical use in ground as well as aircraft powerplants was prophesied in discussions which faced frankly the disadvantages as well as the constructive possibilities of this old art which has been so successfully applied to aircraft.

Results of investigations by one engineer pointed to 50-50 water-alcohol injection as being the most economical fluid for best results; to the realization of best results when fuel of approximately 12 octane numbers lower than the engine requirement is used; and to particular effectiveness on supercharged ground vehicles because water-alcohol injection enables the engine to consume more air at the same engine speed.

In discussion of improving powerplant performance, it was pointed out that the personal aircraft of tomorrow would be able to operate on vehicle fuels if provided with alcohol-water injection.

Mixing of commercial alcohol and gasoline was decried because of the need of a binder, although the discussion disclosed that this practice has enjoyed wide experience for many years.

The engineers recognized that coolant injection would entail the disadvantage of an additional fuel system and the necessity for replenishing the supply. On this point several design and fleet-operating engineers agreed that the advantages of such a development would outweigh these disadvantages, particularly for certain types of vehicle operation.

From the standpoint of maintenance, the coolant-injection test results showed clearly that engines may be expected to operate cleaner. Although results vary with different fuels, engines, and operating conditions, in every case of alcohol-water injection the deposits seem to be softer than usual and easily removed. Correct amounts of coolant do not increase corrosion, and no alkali deposits are found.

Again and again the accelerated development of age-old principles during the war emergency was stressed at these sessions, and engineers were challenged to speed the war effort and lay a firmer foundation of engineering practice for the post-war era – a foundation based in part on the work accomplished for the Army in improving the operating characteristics of military vehicles.

A study of current American power-steering gears which was presented disclosed that one make each is being manufactured in the vacuum and compressed air categories, and four in the hydraulic classification. It was pointed out that current interest in the subject had been accentuated by the Army's need for power steering on front-drive vehicles, and that industry may be ready to tackle the huge problem because of the experience already gained in building power-steering devices for unusually-heavy-loaded vehicles designed for rugged off-the-highway service in a number of industrial applications.

However, it was disclosed, the field is still virtually untapped.

In general, engineers agreed that the source of power for steering should be that which is required to power other controls. This would have the dual effect of reducing first and maintenance costs, and extend the application of these devices to an ever widening field.

Furthermore, several aircraft engineers were intrigued with the possibility of power steering for large planes with tricycle landing gears – a problem, one of them pointed out – that is already plaguing pilots.

TRUCK & BUS SESSIONS

Water-alcohol injection and power brakes were highlighted at the two truck and bus sessions of the meeting.

L. W. FISCHER,

Chairman, Truck & Bus Activity Meetings Committee

"Water-Alcohol Injection for Spark Ignition Engines," by A. T. COLWELL, R. C. CUMMINGS, and D. E. ANDERSON, Thompson Products, Inc., was presented at the session presided over by H. A. FLOGAUS. "Power Steering for Automotive Vehicles" was presented by F. W. DAVIS, consulting engineer, at the second session with B. F. JONES in the chair.

Cold-Starting Techniques, Multiple Engines Featured

... at T & M Sessions

NEW design features in post-war vehicles which will aid in winter starting and improve engine performance were proposed at the Transportation & Maintenance Sessions of the SAE War Engineering-Annual Meeting. Fleet operators made numerous recommendations which may solve problems involved in keeping the nation's highway transportation equipment running at an efficient level. Specifically, electric immersion heaters as the answer to the heavy-duty truck operator's nemesis – cold weather starting – and multiple engines as a greater power source, were suggested improvements founded partly on experience, partly on experimentation.

Although not fully explored for practical purposes, test data have shown electric immersion heaters – installed in the cylinder block to heat the liquid surrounding the cylinder walls – to be of immense help on frosty mornings. Cranking speeds are increased, crankcase oil temperature is elevated, and heat is introduced to the manifold and intake ports. Maintenance costs are consequently reduced by quicker warm-up and better lubrication of the engine during starting.

Operators advised, however, that the heaters must be manufactured to stand the vibration and abuse of riding on heavy-duty trucks, and that engine designers should provide suitable mounts which would allow for ease of application and give the heater adequate support.

Results of cold-room tests presented at the meeting indicated that even in such a comparatively mild climate as Philadelphia, there will be more than 100 days a year when the temperature is low enough to make starting troublesome. They also showed ragged-edge starts to be dangerous, in that with the slightest error in starting technique on the part of the driver, the current supply is so depleted that opportunity to start is lost.

It was revealed that when heat was applied by means of electric immersion heaters, the larger capacity heater showed more thrifty instincts than its little brothers. While it took only 2.2 kw-hr to raise the block liquid from –2 F to 45 F with a 1250 watt heater, it took 5.5 kw-hr to do the same job with a 750 watt heater.

Considering multiple powerplants in motor trucks and buses, opinion veered toward the use of two engines instead of one. Reasons advanced were: (1) there are economies in construction and in subsequent operation of a vehicle of a given performance deriving its power from two independent powerplants, as compared to that of a vehicle of the same given performance, embodying the single power unit; and (2) increased revenue can be obtained from a specific vehicle by adding another engine for optional use, and thus increasing its power.

Some engineers think it conceivable that the saving in construction might run as high as 50% where the performance was the same. Fuel saving would also be considerable, it was argued, since one engine working at two-thirds power would be more efficient than a larger engine running at one-third power when only partial ability of the truck was needed. This was declared to be a large portion of any vehicle's working life. Weight, continually in the hair of highway transportation operators, would take a lick-

TRANSPORTATION & MAINTENANCE SESSIONS

Two sessions, one under the chairmanship of SAE T&M Vice-President E. W. TEMPLIN, the other presided over by W. A. TAUSSIG, presented three papers which emphasized new ideas in vehicle design.

E. N. HATCH,

Chairman, Transportation & Maintenance Activity Meetings Committee

Papers given were: "Cold Starting and Fleet Operation," by E. P. GOHN, Atlantic Refining Co., at the Monday session, and "Advantages of Multi-Powerplants in Motor Buses," by F. R. FAGEOL, Twin Coach Co., and "Possibilities of Multiple Powerplants in Trucks," by RALPH WERNER, United Parcel Service, at the Tuesday session.

ing to the estimated extent of 1000 lb where two engines are used.

When the purpose of using two engines is to increase power, the usual burdens of first cost, and so forth, are present, but the truck is capable of more ton miles. In bus design, one group of operators feels, chief consideration is one of increasing the power so as not to interfere with traffic during accelerating periods or upon long grades. Not only must buses stay out of trouble with traffic, but they must provide passage at a rate comparable to passenger car performance, which means increasing the acceleration rate to the maximum without discomfort to standees.

Vibration and Piston Problems Are Dominant

. . . at Diesel Sessions

EXTENDED wartime use of diesel engines, with total diesel power output now estimated in eight figures, served to direct the attention of engineers to the necessity for making design refinements and for correcting difficulties which, relatively minor in view of the service the diesel is rendering, still handicap peak efficiency.

Case in point reported at Diesel Engine Sessions was control of piston temperature. Various methods, first of measuring the temperature and then of exercising some form of control, comprise the basis of no inconsiderable engineering controversy. Schools of thought, obscurely divided among those who contend that piston heat is dissipated via piston rings, via ring lands and skirts, or via oil cooling, appear to agree that further surveys are necessary to develop fundamentals of piston design and helpfully to apply newly-conceived piston temperature measuring techniques.

At the vortex of the controversy over major avenues of heat escape from the piston appeared a void indicative of lack of definite information so great as to create a demand for exploratory experiments, under SAE aegis, designed to establish the fundamentals. It was further suggested that such experiments and surveys would develop data wherewith to temper opposing preferences for iron pistons, aluminum pistons, scuff bands, and oil cooling, and to enable engineers to achieve their major objective—diesel engines of higher output per unit displacement.

Increased diesel engine operating speeds and temperatures were revealed as directly instrumental in spreading within the diesel field the contagious effects of piston lacquering, which has caused trouble with gasoline engine operations and which variously is blamed upon the products of the automobile and petroleum industries and upon the driving public and the war. Related problem, sludging, similarly was ascribed to multiple causes.

Principal cause of low temperature sludge was said to be water, with varnish no serious problem. At intermediate temperatures, reports said, sludge may be caused either by oil or fuel, and varnish may be serious. Sludge forming at high temperatures was blamed to the oil, with varnish again showing serious possibilities. All three classifications were said actually to overlap under operating conditions.

Correction of torsional vibration in diesel engines, expanding to proportions of a serious engineering problem with widespread applications of diesel power, particularly in naval installations, was said to be progressing rapidly under W.E.B.'s mass coordination of engineering talent.

Diesel operating roughness, resulting in rapid wear of parts, servicing difficulties,

DIESEL ENGINE SESSIONS

Two papers on torsional vibration, followed by prepared discussions, were the basis of one diesel engine session, while another was centered around the study of the piston.

H. S. MANWARING, Chairman, Diesel Engine Activity Meetings Committee

"Methods for Calculating Torsional Vibration," by F. P. PORTER, Fairbanks, Morse & Co., with a prepared discussion by W. W. HENNING, International Harvester Co., and "Bonded Rubber Torsional Vibration Dampers for Diesel Engines," by T. H. PEIRCE, H. A. King Co., with a prepared discussion by DR. J. J. WYDLER, National Supply Co., were presented at a session under the chairmanship of SAE Diesel-Engine Vice-President A. J. BLACKWOOD. "Piston Development Review," by E. T. VINCENT, University of Michigan, and "Piston Lacquering, Its Causes and Cure," by H. C. MOUGEY, with a prepared discussion by J. C. GENIESSE, Atlantic Refining Co., were presented at a session presided over by M. M. ROENSCH.

and, to a degree, in handicapping naval operations at critical periods, generally was ascribed to the diesel's extreme compression and prolonged explosion pressures and to the coincidental setting up of torsional strains in heavy crankshafts and reciprocating parts.

Reported as preliminary to correction were long and involved mathematical operations calling for hundreds of computations. Suggested time-saving detour around the concentrated mass equivalent system of calculating natural frequencies and other essential data came in the form of a proposal to use the reduction method. This method was said easily and directly to produce such necessary data as the first two natural frequencies merely by reference to one Holzer table and by making only one or two numerical operations, as contrasted with the otherwise necessary reference to several Holzer tables and exhaustive arithmetical work.

The reduction method, described as destined for incorporation in the final W.E.B. report on torsional vibration and as helpful to W.E.B.'s proposed development of simplified methods and instruments enabling regular personnel to measure torsional vibration at point of operation, was said to be particularly helpful in the cases of multi-cylinder engines and other complicated installations. The reduction method was credited with automatically providing compensation for the larger influence of some part in deciding one of the natural frequencies and for unknown influences.

Application of a bonded rubber torsional vibration damper was advocated as a practical corrective step, but one calling for individual consideration and independent handling of each case after thorough analysis of the powerplant to ascertain the natural frequency of the system.

The damper was described as consisting of driving member, rubber, and oscillating mass. Driving member, or retainer, and the oscillating mass are bonded by specially prepared crude rubber compounds designed to give the desired deflection and hysteresis when cured in the mold. Design of such dampers was said to require consideration of such factors as the moment of inertia of all reciprocating parts, the equivalent length of the crankshaft between crank pins, and the frequency of the system.

Manufacture and application of rubber dampers were outlined as coming within the growing field of utilization of new synthetic rubbers, properties peculiar to various synthetics making them particularly suitable for such uses.

Heat Treatment, Hardening Of Steels Are Highlighted

. . . at Production Sessions

ARMAMENT production has advanced the techniques of steel hardening about 15 years within the last three, a capacity audience was told at the Production Session, which lasted far into the night with vigorous discussion and recital of experiences gained in both nitriding and induction heating.

Despite the technical improvements of induction heating, engineers were warned that this manufacturing tool is far from pushbutton operation, and that to get eff

sfactory results engineering studies of the t being treated are of great importance. r example, if properly engineered, a part ght be finished with adequate hardness, her a stress in tension or compression – ichever is the most "friendly," and at far ater speed than by accepted gas-fired or uction heaters of only a few years ago, a duction engineer said.

Vast experience with heat-treated shells d shot, it was pointed out, has given the tal working industry a mass of data ich has already proved to be the basis of markable improvements in techniques.

It was evident by the participation in dis-sion of design engineers and metallur-ts, as well as by production engineers, t the war effort has brought about a ordination of engineering thinking long ght by manufacturers.

Repeatedly the need for designers to know re about manufacturing processes and for duction engineers to become more inter-ed in design considerations was stressed detailed reports were recorded of failures a part to take on a proper degree of rdness.

Papers presented brought the art of induc-n heating up to date and went further by pointing to greater manufacturing economy for current armament production and for products of the post-war era.

PRODUCTION SESSION

Induction heat treatment and a method of hardening were the general topics of a single production session organized by SAE Production Vice-President J. E. HACKER.

MR. HACKER was chairman of this session when these papers were presented: "Induction Heat Treatment of Internal Surfaces as Applied to Automotive Industries," by H. E. SOMES, Budd Induction Heating, Inc., and "Tocco Hardening," by H. B. OSBORN, JR., Tocco Div., Ohio Crankshaft Co.

JOSEPH GESCHELIN,
Chairman, Production Activity Meetings Committee

Better Fighting Planes Visioned by Engineers

. . . at Aeronautical Sessions

NEW approaches to problems that have long troubled aeronautical engineers took e limelight in the aeronautic sessions of e 1945 SAE Annual Meeting, disclosing e kind of continuous and solid improve-ent that is doing more to help to win the r than are most of the more publicized lamor" developments.

International Regulations

Leading American transport and design gineers are in general agreement with the ternational airworthiness standards pro-sed at the recent Chicago International vil Aviation Conference, but the industry ll be found questioning a wide variety of tails, extensive discussion at one session dicated. Particularly important were the as expressed because of the great simi-rity between the proposed international andards and the civil aviation airworthiness gulations already in existence in the United ates.

One after another, topflight technicians of e aeronautical industry spoke favorably, in neral, of the proposed standards before ising specific objections or queries as re-rds one or another of the provisions – hich had been laid before the session in nsiderable detail.

Questioned particularly was the 65-mph aximum stalling speed regulation for non-nsport aircraft, which is common to the ited States and the proposed international gulations. Both industry and Government presentatives agreed that this particular andard may leave something to be desired. creased reliability and improved airports, was argued, actually make possible reasonably safe operation under most conditions with planes of stalling speeds substantially in excess of this regulatory demand. Consequently, it was said, if the stalling speed limit was raised, a private owner would be given the privilege of selecting a plane with a higher stalling speed if he so desired, leaving it to his own judgment to select one suitable for the fields from which he expected to operate.

The suggestion to increase from 100 to 200 feet per minute, the minimum rate of climb at 5000-ft altitude for transport aircraft with one engine stopped, was protested by operators because engine-failure accidents for numerous planes capable only of meeting the lower and existing requirement are practically non-existent.

These and other comments on a variety of details indicated an intense interest of the technicians in these international regulations which, currently, are in the hands of industry for comment and suggestion. The Civil Aeronautics Board expects to have those comments, it was reported, by March 15.

The proposed international regulations, it was pointed out, amplify the present American regulations by introducing many more flying-quality requirements than have heretofore appeared in our regulations – although it may be questioned whether such a course should be followed in an international agreement. It was declared that so detailed a treatment may be proper in national regulations, but may still not be a matter for which worldwide uniformity would present enough advantages to justify its being sought at the present time.

Aircraft Engines Problems

The suggestion that a combination gasoline engine-gas turbine would be the most economical powerplant for global operations of aircraft in the post-war world was received with enthusiasm.

There was little argument with the claim that such a combination gives the lowest weight of the powerplant plus fuel for long-range flights at 300 mph and above. It was admitted, in fact, that even if some of the assumptions used, such as the cost of the fuel, had to be modified, the result would remain about the same from a total weight and fuel consumption standpoint.

The value of detonation indicators in the laboratory and in flight was debated at a symposium which revealed descriptive details of several new instruments, together with results obtained in their operation. These devices were shown to be fulfilling an important function in supplementing the interpretation of detonation by sound or from an examination of the exhaust flames. It was argued, however, that their value is greater in laboratory test work than in actual flight operations.

Claims of the favorable effect of these detonation indicators on fuel consumption were admitted, but some technicians felt that this favorable effect was considerably greater in long-range than in short-range flights.

These indicators were reported to have further use in revealing engine malfunctioning when the trouble first develops and before failure of the engine – thus leading to the belief that they may eventually be put to use in checking service engines at overhaul depots and airline terminals.

The consensus of the discussion was that the detonation indicator provides more reliable results than the older methods long in use.

In addition to the discussion of detonation measurement, detonation control came in for attention. Projected for the engineers were diagrams of a new device designed to limit detonation by holding manifold pressure below borderline detonation, regardless of changing conditions of altitude or temperature. Such limitation can be achieved, it was indicated. Applicable to supercharged engines, the device provides a variable supercharging capacity when an engine has two engine-driven superchargers – one driven at constant ratio and the auxiliary through a fluid coupling in which the slip may be varied.

Other discussions urged supercharger performance as being of even greater importance than detonation in limiting high-performance airplanes at high-altitude operation. One defect in holding down supercharger performance, it was pointed out, has been the loss in the supercharger induction passages. Consequently, design of the induction system, it was stated, must be carried out with great care, so as to avoid local air velocities in the passages from reaching the speed of sound.

The conventional method of balancing crankshafts, also important if airplanes are to operate at high speeds without vibration, was reported as giving way to an analytical

All papers presented at this SAE War Engineering-Annual Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

AIRCRAFT, AIRCRAFT ENGINE & AIR TRANSPORT SESSIONS

Aeronautics are playing a dominant part in SAE activities and the ten aeronautic sessions dealt with varied phases of the aircraft industry. Helicopter design, aeroeconomics, electronic controls, hydraulic braking systems, heated wings, and low-drag airfoils comprised the themes of three aircraft sessions.

PETER ALTMAN,

Chairman, Aircraft Activity Meetings Committee

Papers were: "Basic Factors of Helicopter Design," by R. H. PREWITT, Kellett Aircraft Corp., "Application of Aero-Economic Factors to Specific Aircraft Design," by J. B. KENDRICK, Lockheed Aircraft Corp., presented at a session chairmanned by K. D. WOOD. "Electronic Controls in Aircraft," by LT. R. J. COLLIN, JR., Air Technical Service Command, "Electronic Analysis of Airplane Hydraulic Braking Systems," by DUNCAN GARDINER, Vickers, Inc., presented at a session presided over by SAE Aircraft Vice-President R. D. KELLY. "Report on Development and Application of Heated Wings," by LT. MYRON TRIBUS, Air Technical Service Command was given while LEWIS RODERT was in the chair.

Three Aircraft Engine sessions were devoted to engine control mechanisms, radial engines, induction systems, compounded turbine and piston engine, and a symposium on "Detonation Indicators."

A. L. BEALL,

Chairman, Aircraft Engine Activity Meetings Committee

The symposium, under the chairmanship of R. M. HAZEN, held reports on "The Detection of Detonation and Other Operating Abnormalities in Aircraft Engines by Means of Special Instrumentation," by J. W. STREETT, Wright Aeronautical Corp., and "Detonation in Flight, its Effect on Fuel Consumption and Engine Life," by P. J. COSTA, Sperry Gyroscope Co., "Coordinated Engine Control Mechanisms," by JOHN DOLZA, Allison Division, General Motors Corp., and "The Primary Balancing of Radial Engines," by G. L. WILLIAMS and A. B. MILLER, Pratt & Whitney Aircraft Div., United Aircraft Corp., were presented at a session chairmanned by R. W. YOUNG. Another session, under the chairmanship of SAE Aircraft Engine Vice-President A. T. GREGORY, presented papers by A. P. FRAAS, Packard Motor Car Co., "Flow Characteristics of Induction Systems," and C. F. BACHLE, Continental Aviation & Engineering Corp., "Some Possibilities of Turbine Compounding with the Piston Engine."

A joint session of aircraft, aircraft engine, and air transport chairmanned by R. D. KELLY, presented one paper, "International Aircraft Airworthiness Requirements," by EDWARD WARNER, CAB Vice-chairman. Another joint session of aircraft and air transport was held in the form of a symposium, presided over by MR. FROESCH.

Papers were: "Aircraft Lighting," by MAJ. A. D. DIRCKSEN, AAF Technical Service Command; "Psychological and Physiological Aspects of Cockpit Engineering from the Pilot's Viewpoint," by DR. R. A. McFARLAND, Division of Research, Harvard University; "Control Cabin Development," by K. F. GORDON, Boeing Aircraft Co.; and "Making the Cockpit Practical for the Pilot," by G. F. BEAL, Northwest Airlines, Inc.

Two sessions devoted entirely to air transport, included symposiums covering the market for aircraft and airport design.

CHARLES FROESCH,

Chairman, Air Transport Activity Meetings Committee

One symposium, under the chairmanship of WILLIAM B. STOUT, offered reports from W. B. STOUT, Stout Research Div. Consolidated Vultee Aircraft Corp., H. E. NOURSE, United Air Lines, L. WELCH POGUE, CAB and COM. J. J. BERGEN, USNR, "Airport Design versus Aircraft Performance," by ARTHUR AYRES, Pan American Airways, and "Trends in Airport Runway Design," by PAUL STAFFORD, CAA, comprised the second symposium chairmanned by ROBERT J. KERR.

method developed as far back as 1930 by Prof. Albert Coppens of the University of Louvain, but which was not well received at that time. This Coppens method was shown to be correct by a new method of proof felt to be more acceptable to engineers than that originally presented by Prof. Coppens. Trouble has not yet developed from use of the conventional method, it appears, because the differences in actual results between it and the Coppens method are relatively small, being about 0.3%.

Accessories

Invasion of the aircraft field by electronic controls was one of the important developments brought to light in a widespread discussion of aircraft accessories that ran through several of the aeronautical sessions.

Operated through tubes similar to those used in home radio sets, electronic controls were recorded as now being used for such airplane control jobs as automatic pilots, fuel level gages, ice indicators, and special gun control – as well as for the engine detonation indicators mentioned previously.

These controls, engineers disclosed, have proved themselves reliable under battle conditions; their adaptability is greater than any other type of control; they are light in weight; maintenance is at a minimum, the chief job being occasional tube replacements; and they maintain sea-level performance at high-altitude pressures and temperatures, it was agreed.

Electronic principles were shown to have application also in analyzing airplane hydraulic braking system functioning. Oscillographs now record various characteristics of the brake components simultaneously, thus giving records showing how long it takes to fill the brakes, the release time, the influence of tubing length and size on filling and release time; and the performance of the brake valve as a pressure-regulating device.

In general, it is said, the oscillograms show that relatively minor changes may result in wide differences in performance, which emphasizes the conclusion that design changes in the brake system should always be evaluated with the oscillograph.

The system used by the Army Air Forces to prevent ice forming on the wings was another important accessory development described. It comprises a scoop to force air into a heat exchanger, from which it is routed by suitable ducts to the wings and tail surfaces. Here the air circulates between the inner and outer skin of the structure.

Some questioned the reliability of the system, however, and examples of bad experiences were reported with the heat exchangers burning out, causing exhaust gases to be brought into contact with highly stressed members of the wing or fuselage. Alternative systems include a simple method of transmitting the exhaust gas itself directly to the wings and the combustion heater. Which of the systems will predominate in the near future seems likely to depend upon a thorough analysis of weight, efficiency, and safety.

New flying techniques and more severe conditions have required development of improved lamps and general redesign of lighting equipment, another review at these sessions revealed.

Many lamp assemblies, for instance, were shown to have been redesigned to be flush mounted or made smaller to permit the reduction in drag required for high-speed planes. To simplify the problems and require less lamp types, steps have been taken by the Army Air Forces and the Bureau of Aeronautics to standardize on most lighting installations.

The airplane's "business office," the control cabin, also was analyzed – both from the point of view of the engineer and the pilot.

Information from a questionnaire to pilots showed they definitely dislike any arrangement that sacrifices visibility. Almost unanimously they want straight rather than curved windows, because the latter produce distortions and reflections.

Pilots also want instrument panels arranged to permit reading the instruments with minimum shifting of eyes from the normal looking-ahead position.

They feel, too, that indirect rim lighting produces too much glare from the point at which the light source is located and that fluorescent lighting systems cause fatigue and eyestrain.

If pilots are to retain a high degree of efficiency during the hours spent in flight, it was also generally agreed that they must have more comfortable seats and better ventilating and heating systems than are provided in most planes today.

Consensus of opinion was that many aircraft engineering problems offer fruitful fields for research attack under SAE auspices by design engineers, military technicians and operation engineers. Contribution from the psychologist and the physiologist was called for by engineers who listened to the report of a six-year study, embracing about 2000 flight hr, which concluded that the mental attitude of the pilot to his working environment is an essential factor in both safety and in economical operation.

The automobile industry's coordinated effort in developing the sealed-beam headlight was cited when this type of lighting equipment was described by a spokesman of the Armed Forces as a new trend in landing lights, signal lamps, and other illumination.

Ground vehicle engineers felt at home when poor visibility was attacked by pilots and operators, and design engineers conceded

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PRESIDENT for 1945

JAMES MARK CRAWFORD

James Mark Crawford, president of the SAE for 1945, has been an automobile engineer throughout his entire business life.

His record of success covers a variety of assignments requiring skill and ability denoting an unusually wide range of aptitudes. He first gained industry-wide recognition during the 20's as chief engineer of a small car company where personal engineering talent applied directly to design of the product was of major importance and executive problems of organization were minor in character. For the last 15 years, on the other hand, he has carried top executive responsibility for one of the largest engineering organizations in the automotive industry. That organization, led by Jim Crawford, has designed the passenger car which sold in more volume than any other in the world for nine of the ten years preceding discontinuance of car production in 1942.

Jim Crawford began his automobile career as a draftsman with the old American Motor Car Co. in his home town, Indianapolis, in 1906. Before that he had been graduated from Emmerick Manual Training High School, had won a scholarship entitling him to a one-year postgraduate course as an assistant instructor in the forge shop, and had continued his education with two years at the Chicago Art Institute, where he studied illustration.

He went up in the American organization to the position of assistant chief engineer, and then, in 1913, joined Chalmers Motor Co. in Detroit, where he served successively as mechanic, designer, and chief draftsman before becoming assistant chief engineer.

He took his first position as chief engineer when he joined the Allen Motor Co. of Fostoria, Ohio, in 1917, later serving also as manufacturing manager. Then in 1922 he became chief engineer of the Auburn Automobile Co., Auburn, Ind., and was responsible for the design of that car during the period of its sensational rise following assumption of the Auburn presidency by E. L. Cord.

In 1927 he came to Chevrolet as assistant chief engineer under O. E. Hunt, then chief engineer. Two years later he was named chief engineer.

Engineering management problems have had a continually increasing interest for Jim Crawford during the last 17 years, and his operations exemplify to a high degree those qualities of sound organization – ability to assign responsibility, follow through for results, and appreciate the achievements of his associates – which typify result-producing engineering executive work. Added administrative responsibilities, however, have never lessened Jim Crawford's deep personal interest in and knowledge of every detailed phase of technical development. He has kept particularly close contacts with the practical needs and desires of the users and operators of his products, and has devoted an ever-increasing amount of effort to cooperative engineering work of benefit to the industry as a whole.

An important factor in Jim Crawford's success, associates say, is his never-failing forthrightness. A keen analyst, he is always clear about his opinion of any situation after he has obtained the facts – and he is willing that others should know what he thinks.

His operations are as orderly as they are vigorous. Visitors to his office almost invariably find his desk clear; never do they find it cluttered. He has an enviable knack for assigning responsibilities definitely, disposing of questions promptly.

He joined the SAE in 1913, was elected to member grade in 1920, and served as vice-president of Passenger Car Engineering in 1933. He was an SAE Councilor in 1934.

With the beginning of World War II, Jim Crawford became one of the most active members of the important SAE War Engineering Board and assumed the chairmanship of the Coordinating Equipment Research Committee of the Coordinating Research Council, an organization jointly sustained by the SAE and the American Petroleum Institute. He is also an SAE member of the CRC Board of Directors.

Since the inception of the Central Aircraft Council, he has been chairman of that organization's Engineering Policy Committee, and is currently secretary and a director of the Engineering Society of Detroit.

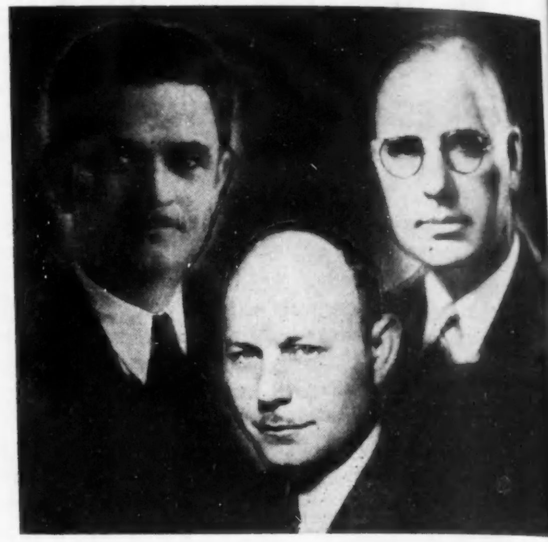
He was born in Indianapolis on August 29, 1886.

★ SAE COUNCILORS ★

PAST-PRESIDENT W. S. JAMES (left), Studebaker Corp., becomes a councilor.

B. B. BACHMAN (center), Autocar Co., is treasurer.

PAST-PRESIDENT MAC SHORT (right) Lockheed Aircraft Corp., continues as councilor.



Continuing on the SAE Council are:

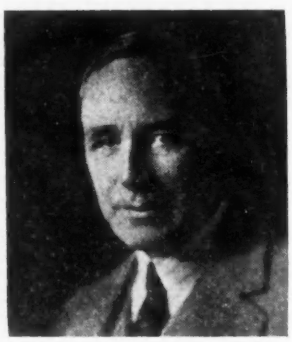
L. R. BUCKENDALE (left), vice-president in charge of engineering, Timken-Detroit Axle Co.;

R. F. STEENECK (center), Cleveland district manager, Fafnir Bearing Co.; and

H. T. YOUNGREN (right), director of engineering development, Borg-Warner Corp.

J. C. Armer

Councilor J. C. Armer (M '31) is vice-president and director of two of Canada's most well-known automotive parts manufacturing companies – Dominion Forge & Stamping Co., Ltd., where he specializes in



forgings for automotive production; and Canadian Motor Lamp Co., Ltd., producers of automotive lamps.

Born in Ontario, Mr. Armer has studied, worked, and become an important part of that Province's civic life. He is a past-chairman of the Ontario Division, Canadian Manufacturers Association.

As chairman of the Drop Forge War Service Committee, Mr. Armer, who was a lieutenant in the Canadian Engineers in World War I, is responsible for the coordination of forgings' production used in Canada's present war output.

He has devoted much time to SAE affairs as well, serving as chairman of the SAE Canadian Section for 1934-1935, and as a member of the SAE Placement Committee.

F. C. Patton

Councilor F. C. Patton (M '27) has been associated with the Los Angeles Motor Coach Lines since its formation in 1923. He joined this organization as assistant manager after having been transferred there from Pacific

Electric Railway. In 1936 he was appointed manager, a position he has held since.

Mr. Patton has been one of the most active members of the Society, serving on technical committees and in various official capacities. He has served the SAE Southern California Section as secretary, treasurer, vice-chairman, a member of its governing board, and chairman. Since 1933 he has been a member of the SAE Transportation & Maintenance Committee, acting as Western vice-chairman in 1937.

Among his other services to the Society have been membership on the SAE Truck, Bus & Railcar Activity Committee in 1938; and Meetings Committee representative for the SAE Southern California Section for several terms.

R. J. S. Pigott

Councilor R. J. S. Pigott (M '18) has applied his engineering skill to many inventive uses, particularly in the field of fuels and lubricants. As chief engineer of Gulf Research & Development Co. he has been

engaged in work on heat distribution in internal-combustion engines and on the behavior of lubricating and fuel pump systems.

After installing the power and service station in the Remington Arms plant, Bridgeport, during World War I, Mr. Pigott managed the Bridgeport Brass Co. for two years, and then the Crosby Steam Gage & Valve Co. for the same period. He was also consulting engineer for Public Service Production Co. for several years.

Mr. Pigott, who has approximately 30 patents covering equipment for power stations, oil burners, and so forth, has done extensive Coordinating Research Council work, and was 1944 vice-chairman of the SAE Fuels & Lubricants Activity Committee.

VICE-PRESIDENTS

WILLIAM LITTLEWOOD

Vice-President, Air Transport Activity

William Littlewood (M '36), whose career in aviation began seven years after his graduation from Cornell University in 1920, started in the field as an aircraft engine developer and manufacturer. He is now vice-president of American Airlines, Inc.

Although Mr. Littlewood first displayed interest in machine tool manufacturing, working with Niles-Bement-Pond Co. and later Ingersoll-Rand Co., he followed the trend toward aviation in 1927 and joined the Fairchild Engine Co., where he helped engineer and build the Caminez "cam" engine. He then was on the engineering staff of American Airways, becoming chief engineer of its successor, American Airlines, Inc., in 1930. He was advanced to his present position in 1937.

Mr. Littlewood was awarded the Wright Brothers Medal for 1935. A member of the National Advisory Committee for Aeronautics, he is now also serving as chairman of the SAE Aircraft Accessories & Equipment Subdivision.

* * *

J. L. ATWOOD

Vice-President, Aircraft Activity

J. L. Atwood (M '40), vice-president and assistant general manager, North American Aviation, Inc., decided engineering was his forte during his academic years. After graduating from the University of Texas in 1928, where he received a civil engineering degree, he spent two years at the Army Aircraft Branch, Wright Field, doing stress work. He then moved to the West Coast, becoming affiliated with Douglas Aircraft Co.

There he met J. H. Kindelberger, then Douglas' chief engineer, who chose Mr. Atwood to come with him to North American Aviation as chief engineer in 1934 when he became president of that company. One year later Mr. Atwood was named vice-president of the company.

Mr. Atwood has been a member of the SAE Aircraft Activity Committee since 1941.

* * *

R. W. YOUNG

Vice-President, Aircraft-Engine Activity

R. W. Young (M '31), chief engineer, Wright Aeronautical Corp., has worked for the same company since receiving his M.S. degree from Yale University in 1925.

He served Wright as a test engineer for two years, then became an experimental engineer. For the next few years he was executive engineer, until he was promoted to technical director of the Foreign License Division in 1933. He became assistant engineer in 1935, holding that post for five years. In quick succession then he was raised to assistant chief and chief engineer.

Mr. Young, who was an infantryman during World War I, and a second lieutenant in the O. R. C. Ordnance from 1922 to 1927, was awarded the Manly Medal for 1936 for his paper "Aircooled Radial Aircraft-Engine Performance Possibilities." He is vice-chairman of the Aircraft Engine Subdivision of the SAE Standards Committee.

★ ★ ★ ★ **VICE-**

W. A. PARRISH

Vice-President, Diesel-Engine Activity

W. A. Parrish (M '17) has had a widely varied engineering experience. A specialist in design, Mr. Parrish is now executive engineer, Superior Engine Division, National Supply Co.

His career includes connections with Packard, where he worked on racing car and truck design; with Continental Motor Corp., where he developed the earliest of 12-cyl V-type internal-combustion engines; and with International Harvester Co. as chief draftsman on truck design during production of military trucks in World War I. Twice he served as chief engineer; with Thomart Motor Co. from 1919-1921, and with Buda Engine Co. from 1928-1938. From 1940-1941 he was assistant chief engineer of Cummins Engine Co.

Mr. Parrish's SAE activities have included membership on the SAE Diesel Engine Activity Committee since 1935, and secretaryship of the SAE Chicago Section for 1938-1939.

M. O. TEETOR

Vice-President, Fuels and Lubricants Activity

M. O. Teetor (M '24) wavered between business and engineering as a vocation from the time he left the University of Pennsylvania to study economics at the Wharton School of Commerce, until he joined the executive sales force of the Perfect Circle Co. His natural inclination towards technical matters decided him on engineering, however, and shifted him from sales and factory manager to executive engineer of Perfect Circle, which position he has had for the past 12 years.

Mr. Teetor, whose talents extend to music as well, composed the popular songs "Lost" and "I Saw You First." Technical writing, however, is of equal interest to him, and one of the many papers he has contributed to the *SAE Journal* is "Load Carrying Capacity Phenomena of Bearing Surfaces."

He was 1938-1939 chairman of the SAE Indiana Section and served on the Society's Engine Wear Research Committee.

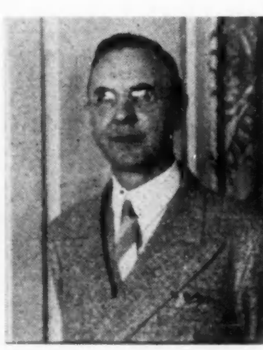
A. G. HERRESHOFF

Vice-President, Passenger Car Activity

A. G. Herreshoff (M '15), chief engineer of research, Chrysler Corp., is engaged in development of a large-size, liquid-cooled aviation engine. Since joining Chrysler in 1927, he has served in various engineering capacities including those of chief engineer of the Fargo Truck Division, chief engineer of Dodge Truck Division, and assistant chief engineer, Passenger Car Division.

His experience dates back to work at the Herreshoff Mfg. Co. in Bristol, R. I., where he was born. He then went to Gas Engine & Power Co., after which he spent six years with Mack Truck, Inc. during the World War I period. Later he became, successively, chief engineer of Bethlehem Truck, and engineer of Fifth Avenue Coach Co. and of Rushmore Laboratories.

Mr. Herreshoff, who attended M.I.T., was 1943-1944 chairman of the SAE Detroit Section.



W. T. FISHLEIGH

Vice-President, Passenger-Car Body Activity

W. T. Fishleigh (M '13) is a consulting engineer in Detroit, specializing in patent experting. His first connection with the automotive industry was as an executive engineer at Packard. He later returned to the University of Michigan, his alma mater, as professor of engineering, where he organized and directed the first complete course in automobile engineering.

He continued his career while serving as a lieutenant colonel during World War I in the Motor Transport Corps in charge of design and production of motor ambulances. For over 10 years following the war until he began his present practice, Mr. Fishleigh was executive engineer with Ford Motor Co.

He is a past-chairman of the SAE Detroit Section, and was a Councilor of the Society in 1933 and 1934.

PRESIDENTS

L. V. CRAM

Vice-President, Production Activity

L. V. Cram (M '11), who has been associated as an engineer with General Motors Corp. almost consistently since 1908, is now on special assignment with the Detroit Diesel Engine Division of the company.

Except for a period when he served as production engineer for Empire Automobile Co. and Mercer Motor Co., Mr. Cram has been in the employ of GMC subsidiaries: first with Oakland Motor Co., then Buick Motor Co., and in 1922 he joined Chevrolet as resident engineer. He remained there until 1940 when he went to Allison Division as production engineer, and three years later he assumed his present position.

Mr. Cram was 1944 vice-chairman of the SAE Production Activity Committee, and served as meetings committee representative of the SAE Indiana Section for 1941-1942.

W. F. STREHLOW

Vice-President, Tractor and Farm Machinery Activity

W. F. Strehlow (M '30) as chief engineer, Tractor Division, West Allis Works, Allis-Chalmers Mfg. Co., is concerned with work on all-wheel tractors and engines. He has done most of the engineering and designing of the first rubber-tired farm tractor, and has also developed automotive equipment for the Ordnance Department and the Air Forces.

His contributions to SAE affairs have been many. He served the SAE Milwaukee Section as secretary, vice-chairman and chairman in three successive years; he is on the SAE Tractor War Emergency Committee and is chairman of the TWEC Fuels Subcommittee. For the past year he was vice-chairman of the Tractor & Farm Machinery Activity Committee.

E. P. GOHN

Vice-President, Transportation and Maintenance Activity

E. P. Gohn (M '37) reached his present position of chief test engineer of the automotive transportation department, Atlantic Refining Co., in 1936, ten years after joining the company. The first decade of his employment there was in the automotive laboratory research and development department as a junior engineer.

Mr. Gohn, a graduate from the University of Pennsylvania, has been active in SAE T&M activities. He was vice-chairman of the SAE-ODT Maintenance Methods Advisory Committee as well as a member of the T&M War Advisory Committee. He was chairman of the SAE Philadelphia Section for 1941-1942.

H. A. FLOGAUS

Vice-President, Truck and Bus Activity

H. A. Flogaus (M '18), vice-president in charge of engineering, ACF-Brill Motors Co., is chiefly interested in the ultimate in cost and weight reduction, and the combination of functional design possibilities with the ultimate in artistic treatment to bring about maximum sales appeal.

Prior to joining the Brill organization in 1939, where he held the posts of assistant to the vice-president and chief engineer, Mr. Flogaus was vice-president in charge of engineering and production at Reo Motors, Inc. He served for nine years before that as motor coach engineer, General Motors Truck & Coach Co.

Engaged in the development of automatic automotive transmissions and new suspension or springing systems, he has also been a member of several SAE committees, the most recent one being the Truck & Bus Activity Committee.

All papers presented at this SAE War Engineering – Annual Meeting will appear in a later issue of the *SAE Journal* either in full in the Transactions Section or as digests.

that improvements are to be expected in this respect.

Helicopter Design

Basic engineering principles and processes growing out of the years of experimentation leading to current helicopter design practice were stressed in one discussion which touched only lightly the immediate economic future of these air vehicles.

Design of rotor blades for helicopters, it was explained, is largely a problem of compromising a number of factors. For a high-torque, slow-turning rotor, it was said, the transmission and blades may become excessively heavy or the blades may have excessive coning angles. Ship roughness originating in the rotor is more likely to occur when the ratio of forward speed to tip speed becomes too great. The sum of the forward speed and the rotational speed should remain sufficiently below the speed of sound to avoid rotor noise and compressibility effects, it was shown.

Limited comments on the helicopter's commercial future showed some technicians envisioning it as an important competitor for fixed-wing planes and others seeing its importance, even as an aerial taxi, resting a long way in the future.

More extensive, however, was discussion during the sessions of how to determine the dollar value of a pound in design of standard-type airplanes.

A method of investigating the economic value of these and other conditions affecting the utility of an airplane was presented.

Also advanced was the suggestion that air cabs carrying five passengers on 10- to 20-mile flights can be made practical at travel costs not greatly exceeding those of land vehicles. A thorough study seems to indicate that the fixed-wing aircraft, operating from 1500-ft runways, is most logical for the future, with landing sites spaced five miles apart, cruising speed to be 100 to 200 mph.

With scheduled air operations, 75-100 miles was mentioned as being about as short a trip as airlines will be able to schedule for some years to come. This statement was supported by a large volume of carefully compiled data.

As local transport service becomes "big business," sound financing will become as necessary as good engineering. There is no doubt, according to a representative of the underwriters, that they will be interested in this growing business, which, it seems, will win public confidence for its profit possibilities – a controlling factor in financing.

Airports

Progress in airport design, one discussion brought out, has led to special designs, such as military airports with runway layouts having few intersections so that a couple of well-placed bombs cannot close several runways simultaneously.

Commercial airports were said to require adequate taxiways so that runways can be kept clear of aircraft not actually loading or taking off. Such designs as the tangential or "pin wheel" layout, the tandem runway plan, which places two runways end to end, and the overlapping tandem runway have been designed to give fast, safe, efficient, and economical traffic flow.

Organization of an international association of aircraft, airport and airline engineers to bring the world's airport facilities abreast of airplane progress was proposed. It was explained that few airports, even those built during the war, can accommodate the larger planes currently used or contemplated.

In the last 10 years the weight of commercial planes has increased approximately six and one-half times, with the result that runway lengths must be increased at least 3000 ft, a speaker concluded.

ENGINEERING DISPLAY

Most of the 37 exhibits at the SAE War Engineering-Annual Meeting between Jan. 8-12, focused the attention of the whole convention on war products and improvements in manufacturing processses. The exhibitors were:

Adel Precision Products Corp., Burbank, Calif.
Aeroquip Corp., Jackson, Mich.
Aircraft Screw Products Co., Inc., Long Island City, N. Y.
Aluminum Co. of America, Pittsburgh, Pa.
Aluminum Industries, Inc., Cincinnati, Ohio
American Bosch Corp., Springfield, Mass.
Black Drill Co., Cleveland, Ohio
Cleveland Graphite Bronze Co., Cleveland, Ohio
Continental Motors Corp., Muskegon, Mich.
Crane Packing Co., Chicago
Detroit Gasket & Mfg. Co., Detroit, Mich.
Diesel Engine & Mfg. Co., Chicago
Ex-Cell-O Corp., Detroit, Mich.
Fram Corp., East Providence, R. I.
Gemmer Mfg. Co., Detroit, Mich.
Hayes Industries, Inc., Jackson, Mich.
Hercules Motors Corp., Canton, Ohio
Kopper Co., American Hammered Piston Ring Div., Baltimore
Lord Mfg. Co., Erie, Pa.
Monroe Auto Equipment Co., Monroe, Mich.
Petroleum Advisers, Inc., New York
Physicists Research Co., Ann Arbor, Mich.
Remington Rand, Inc., Buffalo, N. Y.
Spicer Mfg. Corp., Toledo, Ohio
Stewart-Warner Corp., Chicago
The DeLuxe Products Corp., LaPorte, Ind.
The Flex-O-Tube Co., Detroit, Mich.
The Garlock Packing Co., Palmyra, N. Y.
The S. K. Wellman Co., Cleveland
Tinnerman Products, Inc., Cleveland
Torrington Mfg. Co., Torrington, Conn.
Truck Equipment Co., Buffalo, N. Y.
Tubing Seal-Cup Inc., Los Angeles
United Chromium, Inc., New York
Victor Mfg. & Gasket Co., Chicago
Waukesha Motor Co., Waukesha, Wis.
Zollner Machine Works, Fort Wayne, Ind.

Peoria Now a Section

SECTION status was granted to the Peoria Group Jan. 7 by the Council, making this the 28th Section of the Society. There has been no change among the officers who have been serving since June.

Since its organization as a Group two and one-half years ago, Peoria's total membership has increased from 27 to 76—and a promise of continued growth is indicated by the fact that attendance at meetings is consistently more than twice as high as the total membership.

CRC Directors

DIRECTORS elected for two-year terms at the annual meeting of the Coordinating Research Council, Inc., in January were D. P. Barnard, G. H. B. Davis and J. F. M. Taylor, nominated by the API; and B. B. Bachman, W. S. James and C. G. A. Rosen nominated by the SAE.

Continuing as directors to fill unexpired terms are T. G. Delbridge, R. A. Halloran, K. G. Mackenzie, and G. G. Oberfell for the API; and J. M. Crawford, William Littlewood, Arthur Nutt and J. C. Zeder for the SAE.

Journal Index Available

A complete Index covering the twelve 1944 issues (Vol. 52) of the *SAE Journal* is now available to members and subscribers free upon request.

SAE Coming Events

Society Membership Doubles in 5 Years . . .

DURING the past five years the SAE has a trifle more than doubled its membership. The Society started its 1945 calendar year with 11,960 members on its rolls as compared with a membership total of 5972 at the beginning of 1940.

The current membership figure is an all-time high in the history of the Society and the trend continues upward. In 1944 there was a net increase of 1935 members, a record for any one year.

Applications received during the year totaled 2407, slightly less than the 2478 figure for 1943. Membership losses resulting from death, resignations and dropping actions amounted to only 337, the lowest for any one year in more than a decade.

Section Meetings

Baltimore – Feb. 8

Engineers Club; dinner 6:30 p.m. The Future of Air Transportation – Peyton M. Magruder, director of commercial aircraft sales, Glenn L. Martin Co. U. S. Aeronautical Standardization Mission to Great Britain – J. D. Redding, manager, Aeronautical Dept., SAE.

Buffalo – Feb. 23

Statler Hotel; meeting 8:00 p.m. Co-sponsored meeting with The Engineering Foundation of Buffalo. Rockets – G. Edward Pendray, engineer, Westinghouse Electric & Mfg. Co.

Chicago – Feb. 13

Knickerbocker Hotel; dinner 6:45 p.m. Gas Turbine and Jet Propulsion – John I. Yellott, director, Institute of Gas Technology.

Cincinnati – Feb. 15

Wright Aeronautical Plant; dinner 6:00 p.m. The Cincinnati Division of Wright Aeronautical Corp. – Its History and Facilities – R. T. Howe, assistant plant manager, Wright Aeronautical Corp. Illustrated with motion pictures and slides. Inspection tour through the Wright Aeronautical Plant at Lockland, O., at 1:30 p.m. Meeting restricted to SAE members.

Cleveland – Feb. 12

Cleveland Club; dinner 6:00 p.m. Post-War Truck Selection and Conditioning – E. P. Gohn, automotive engineer, Atlantic Refining Co.

Colorado Group – Feb. 15

Joint meeting with ASME. Preliminary Design of Helicopters and Jet Propulsion Engines – K. A. Wood, professor of aeronautical engineering, University of Colorado.

Detroit – Feb. 5

Horace H. Rackham Educational Memorial Bldg.; dinner 6:30 p.m. Naval Aviation Today in the Pacific – Hon. Artemus L. Gates, assistant secretary of the Navy for Air.

Indiana – Feb. 7

Antlers Hotel, Indianapolis; dinner 6:45 p.m. Engineering Organization – J. M. Crawford, chief engineer, Chevrolet Division, General Motors Corp. and president, SAE. Guest – John A. C. Warner, secretary and general manager, SAE.

Metropolitan – Feb. 1

Pennsylvania Hotel; meeting 8:00 p.m. Symposium on Cold Starting. Speakers: R. H. Dalgleish, Jr., assistant to vice-president of operations, Philadelphia Transportation Co. E. P. Gohn, automotive engineer, Atlantic Refining Co. H. C. Riggs, electrical engineer, Electric Storage Battery Co.

Milwaukee – Feb. 2

Milwaukee Athletic Club; dinner 6:30 p.m. Trend of Magnaflux Inspection in Automotive Industry – C. E. Betz, vice-president, Magnaflux Corp. Demonstration of Magnaflux Machine.

New England – Feb. 6

Engineers Club, Boston; dinner 6:30 p.m. Power Plants and Transmission Line Units – Robert Cass, chief engineer, White Motor Co.

Northwest – Feb. 2

Gowman Hotel, Seattle; dinner 7:30 p.m. Practical Operation on Wartime Gasoline – R. I. Mahan, technical assistant to manager, Union Oil Co. of Calif.

Oregon – Feb. 2

Imperial Hotel, Portland; dinner 6:30 p.m. Subjects: Design and Operation of Turbo Charged Diesel Engines. Torsional Vibration of Crankshaft. Speakers to be announced.

Peoria – Feb. 19

Jefferson Hotel; dinner 6:30 p.m. Applications of the Automotive Two Cycle Diesel Engines – F. G. Shoemaker, chief engineer, Detroit Diesel Engine Division, General Motors Corp.

Philadelphia – Feb. 14

Engineers Club; dinner 6:45 p.m. Water Injection – A. T. Colwell, vice-president, Thompson Products, Inc.

St. Louis – Feb. 8

Forest Park Hotel; dinner 6:30 p.m. C. G. A. Rosen, director of research, Caterpillar Tractor Co. Subject to be announced. Guests – J. M. Crawford, chief engineer, Chevrolet Division General Motors Corp., and president, SAE. John A. C. Warner, sescretary and general manager, SAE.

Southern California – Feb. 8

Ambassador Hotel, Los Angeles; meeting 8:00 p.m. Passenger Car Meeting. Speaker to be announced.

Southern New England – Feb. 7

Bond Hotel, Hartford; dinner 6:45 p.m. Speaker and subject to be announced.

Southern Ohio – Feb. 21

Van Cleve Hotel, Dayton; dinner 6:45 p.m. Railroad Motive Power Equipment – C. M. Davis, engineer, Transportation Division, General Electric Co.

Spokane Group – Feb. 9

Spokane Hotel; dinner 7:00 p.m. Carburation – J. H. Ray, Jim Ray's Service Garage.

Syracuse – Feb. 5

Museum of Fine Arts; meeting 8:00 p.m. Development of the Bell Helicopter – Art Young, chief engineer, Bell Helicopter Division, Bell Aircraft Corp. Motion Pictures.

Texas – Feb. 16

Blackstone Hotel, Fort Worth; dinner 6:30 p.m. Aircraft Transportation. Speaker to be announced.

Twin City Group – Feb. 1

Curtis Hotel, Minneapolis; dinner 6:30 p.m. Chemical Additives for Lubricating Oils – John H. Baird, lubricating engineer, Lubri-Zol Sales Co.

Wichita – Feb. 1

Droll's English Grill; buffet luncheon 7:00 p.m. Agricultural Equipment – Speaker to be announced. Motion Pictures.

Adam K. Stricker, Jr. (left), industrial engineer with the U. S. Army Signal Corps, is shown receiving the Exceptional Civilian Service Award, highest civilian commendation of the War Department, from Major-Gen. H. G. Ingles, chief signal officer. The citation presented to Mr. Stricker, who is on leave from the Office of the Chairman, General Motors Corp., was "in recognition of his outstanding planning and organizational ability in the development of systems which greatly facilitated the procurement, storage, packaging, and issue of Signal Corps equipment"

About

D. S. HARDER, who resigned as director of the tank section, Fisher Body Division, GMC, Detroit, is now president and general manager, E. W. Bliss Co., Brooklyn, N. Y. Mr. Harder was 1944 vice-chairman of the SAE Detroit Section.

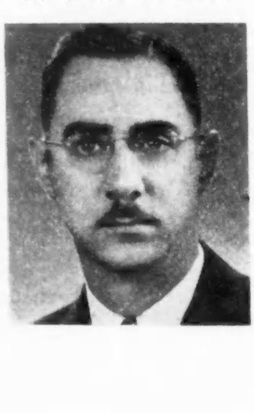
ROBERT C. KELLOGG, formerly standards engineer, Consolidated Vultee Aircraft Corp., Allentown, Pa., is now production engineer, Perfection Stove Co., Inc., Cleveland.

Previously president, Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, **HARRY C. WANNER** has been named manager, Midwestern Magnesium Co., Garrett, Ind.

LINWOOD F. MILLEN is now senior engineer, B-29 fuel pumps, Eclipse Machine Division, Bendix Aviation Corp., Elmira, N. Y. He had been B-29 engineering coordinator, Bell Aircraft Corp., Marietta, Ga.

DR. HOWARD W. BARLOW, former head of the department of aeronautical engineering, Texas A. & M. College, has been elected dean of the School of Engineering of the college. Dr. Barlow is vice-chairman of the SAE Texas Section.

Dr. Howard W. Barlow



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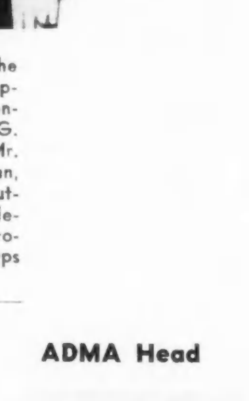

Tom O. Duggan

TOM O. DUGGAN, vice-president of Thompson Products, Inc., has recently been elected president of the Aviation Distributors & Manufacturers Association at its second annual conference in St. Louis.

GEORGE KRIEGER has returned to Ethyl Corp. following a two-year leave of absence with the War Production Board, where he served as chairman of the Farm Machinery & Equipment Division and later as a special assistant to Donald M. Nelson. In his new post, with headquarters in New York City, Mr. Krieger will be in charge of rural marketing and special development work as assistant to **JULIAN J. FREY,** general sales manager. Mr. Krieger is a past-chairman of the SAE Tractor & Farm Machinery Activity Committee.

OTTO E. KIRCHNER, director of aircraft engineering, American Airlines, Inc., Jackson Heights, L. I., N. Y., is currently president of the Airport Kiwanis Club at LaGuardia Field, which sponsors community activities at the airport and in many other areas. Mr. Kirchner is a member of the SAE Aircraft Engine Activity Committee.

R. H. CASLER, former manager of the Aircraft Division, Bendix Westinghouse Automotive Air Brake Co., Elyria, Ohio, is now a consulting engineer, Roy S. Sanford Engineering Co., Oakville, Conn.

RAYDELLE JOSEPHSON is now employed as assistant patent attorney, Sperry Gyroscope Co., Garden City, L. I., N. Y. She had been research associate in physics, California Institute of Technology, Pasadena.

FRED H. LOCKWOOD, formerly director of public relations, Guiberson Diesel Engine Co., Dallas, Tex., is now associated with E. B. Mathewson Co., Chicago.

ENSIGN ROY G. LaGRANT, USNR, has moved from Puget Sound Navy Yard, Bremerton, Wash., to San Pedro, Calif., where he is assistant industrial engineer.

CAPT. JOHN S. IRVING is now connected with Girling, Ltd., Birmingham, England, as technical director. He had been joint general manager, Bendix, Ltd., same city.

PHILIP A. SIDELL, previously chief engineer, DeBothezat Division, American Machine & Metals, Inc., East Moline, Ill., now is employed by Gale Products Division, Outboard Marine & Mfg. Co., Galesburg, Ill., in the same capacity. He is also a consulting engineer for DeBothezat Division.

CHARLES S. WHITE, formerly research engineer, Micromatic Hone Corp., Detroit, is on the staff of Sav-Way Industries, Special Machine Division, Centerline, Mich., as chief engineer.

CLIFTON M. CHASTAIN, technical adviser for the U. S. Army, has been transferred from Kelly Field, Tex., to Wright Field, Dayton, Ohio.

CARL E. SWANSON has been appointed manager of communications and engineering, Northwest Airlines, Inc., St. Paul, Minn. Mr. Swanson, who had been superintendent of communications for the company, will head a single division combining activities of both communications and some of the engineering groups.

Carl E. Swanson

SAE Members . . .

SAE members **WILLIAM P. HOARE,** superintendent, repair base and modification center, United Air Lines, and **R. L. ANDERSON,** superintendent of engineering, Chicago & Southern Air Lines, have been largely responsible for the awards presented to their respective companies by *Aviation* "in recognition of outstanding maintenance performance and developments" for 1944. These awards are bestowed annually by the magazine.

W. E. BAPTIST, who had been chief inspector, National Motor Springs, Pty., Ltd., Aircraft Parts Division, Alexandria, N.S.W., Australia, is now with the Department of Aircraft Production, Maintenance Division, N.S.W., as technical services superintendent.

DR. ZAY JEFFRIES, former technical director of General Electric Co.'s lamp department, has been elected vice-president of the newly created chemical department of the organization. Dr. Jeffries has been with General Electric since 1914.

VERN Z. PERRY is now president and general manager, Knightstown National Body Mfg. Co., Knightstown, Ind. He had been passenger bus body designer and production planner, Ward Body Co., Conway, Ark.

HENRY C. ZUNKER, formerly assistant foreman of engine repair for the U. S. Government, Kelly Field, Tex., is now administrative Air Corps technical inspector, San Antonio Air Technical Service Command, same address.

R. FRANK WILSON has joined Taylor Mfg. Co., Milwaukee, Wis., as assistant to the president. He had been contract engineer, Internal Combustion Engine Section, U. S. Navy, Bureau of Ships, Washington, D. C.

RACY D. BENNETT, who has resigned as manager of the Hydraulic Division, Vinco Corp., Detroit, has established offices as a consulting engineer in Los Angeles.

Racy D. Bennett

A former manager of the Airplane Division, Curtiss Wright Corp., Bloomfield, N. J., **LA VERNE B. RAGSDALE** is now the president of Ragsdale & Co., New York City.

ROBERT F. PAINTER, who had been in the U. S. Army, stationed at Camp Wolters, Tex., is now a junior engineer for International-Plainfield Motor Co., Plainfield, N. J.

EDWARD KOCZAT, U. S. Navy, has been transferred from the Naval Training Center at Great Lakes, Ill., to the one at Norman, Okla.

Inactive Duty

Lt.-Com. K. L. Herrmann

LT.-COM. K. L. HERRMANN, with the Navy Department, Bureau of Aeronautics, since January, 1942, has at his request been relieved from active duty. Mr. Herrmann expects to set up a pilot plant and laboratory for the production of cam engines in the Los Angeles area.

L. WILSON HEDDINGS, who had been branch service manager, White Motor Co., Washington, D. C., has the same position for Nolan-Brown Motors, Inc., Miami, Fla.

E. O. ASHLEY, formerly connected with National Farm Machinery Co-op., Inc., Shelbyville, Ind., is now associated with Shelby Machine Co., same city.

Previously tool engineer, International-Stacey Corp., Columbus, Ohio, **ROLAND V. FISCH** is now in the construction and repair department, Grasselli chemicals department, E. I. du Pont de Nemours & Co., Grasselli, N. J.

ROBERT U. WHITNEY, JR., formerly with Elastic Stop Nut Corp., Union, N. J., as experimental engineer, is now with Multi-Products Tool Co., Newark, N. J., as chief tool engineer.

Irving B. Babcock is now president of Aviation Corp., having assumed this post Feb. 1. Mr. Babcock, who resigned from his positions as president of GMC Truck & Coach Division, and vice-president of General Motors Corp., has served as an adviser to the War Production Board, the Office of Defense Transportation, and as director of the Automotive Council for War Production

JOHN E. WALSTON, civilian automotive adviser for the U. S. Army, has been transferred from Camp Breckenridge, Ky., to Camp Shelby, Miss.

Previously dynamometer test mechanic, Hall Scott Motor Car Co., Berkeley, Calif., **EARLE C. WILLIAMS** is now shop supervisor, transportation department, Quonset Naval Air Station, R. I.

JOHN BORLAND, formerly in the service engineering department of Elastic Stop Nut Corp., Newark, N. J., is now on the engineering staff of Clark Equipment Co., Buchanan, Mich.

ROWLAND C. LEE, who had been assistant chief engineer, Harvill Corp., Los Angeles, is now aerodynamics engineer, Northrop Aircraft, Inc., Hawthorne, Calif.

Previously methods engineer, Eastern Aircraft Division, GMC, Linden, N. J., **FREDERICK G. STEHMAN** is now production engineer, Selfwinding Clock Co., Brooklyn, N. Y.

HELMUTH G. BRAENDEL is no longer chief development engineer, Continental Motors Corp., Detroit, having joined the

Helmuth G. Braendel

staff of Wilkening Mfg. Co., Philadelphia, as chief engineer.

RAY D. McMULLIN, chief production engineer, Lawrence Aeronautical Corp., Linden, N. J., spoke on "Production Engineering, Coordinating the Division and Its Functions within the Organization" at the Philadelphia Navy Yard, Dec. 8.

Ray D. McMullin

EZRA HOLLISTER is no longer chief engineer, Jesco, Inc., Los Angeles, having joined Bendix Aviation Corp., Pacific Division, Los Angeles, as hydraulic development engineer.

ENSIGN GEORGE K. STEPHENSON, USNR, may be reached at the Naval Construction Training Center, Davisville, R. I. In civilian life he was assistant equipment engineer, Douglas Aircraft Co., Inc., Tulsa, Okla.

JOHN E. SIEBEL, now in the U. S. Army, is stationed at Sheppard Field, Tex. He had been design engineer, United Aircraft Products, Inc., Los Angeles.

LT.-COL. FRED J. MECHLIN is now on inactive duty, and has returned to his former position with the Louisiana Department of Revenue, Baton Rouge, La., where he is head of the motor fuel laboratory. He had been in the U. S. Army Air Forces at the Minneapolis Area Office in Minnesota.

Previously service engineer, Marine Engine Division, Packard Motor Car Co., Detroit, **WILLIAM J. CRANDALL** is now vice-president and chief engineer, Ragsdale & Co., New York City.

ELDRED H. HUFF is no longer employed at Howard Aircraft Corp., St. Charles, Ill., as works manager. He is now with Fairchild Engine & Airplane Corp., Hagerstown, Md., as manufacturing manager of cargo operations.

LESLIE H. BREWER, formerly metallurgical control specifications writer, Pratt & Whitney Aircraft, East Hartford, Conn., is now aircraft engineer, Bechtel McCone Corp., Aircraft Division, Birmingham, Ala.

M. M. DANA, a captain in the U. S. Navy, has been transferred from the Navy Department, Bureau of Ships, Washington, D. C., to the Office of the Assistant Industrial Manager, Mare Island Navy Yard, San Francisco.

TOM ELLEMAN has joined Continental Motors Corp., Muskegon, Mich., as engineering department design engineer. He had been chief engineer, Bolens Products Co., Port Washington, Wis.

Previously Subcontract Division, Transport Bodies, Inc., Portland, Ore., **ROBERT V. TURNER** is now general manager, Axle Division, Pointer Willamette Co., same city.

FREDERIC SALTZMANN, former chief engineer of Die Typing Corp., Detroit, now has the same position with W. L. Behrens Co., same city.

JAMES C. CARTER is no longer chief engineer of Clarke Aero Hydraulics, Inc., Pasadena, Calif., having joined Pardee Co., same city, as a partner of the organization.

RAYMOND G. HILLIGOSS, formerly lubrication engineer, Boeing Aircraft Co., Wichita, Kan., is now general manager, Bartlesville Bus Co., Bartlesville, Okla.

ROBERT W. REID, who had been test engineer, research and development department, Rogers Diesel & Aircraft Corp., New York City, is now chief test engineer, research and development, American Engineering Co., Philadelphia.

EMORY DE NADOR is now engineer in charge of automobile activities, Atlas Supply Co., Newark, N. J. He had been on the engineering staff of Ford Motor Co., Dearborn, Mich.

ERNEST G. LeMAY, JR., in civilian life experimental test engineer, Wright Aeronautical Corp., Paterson, N. J., is now a radio technician in the U. S. Navy, stationed at Corpus Christi, Tex.

JOHN W. ZIMMERMANN, JR., now is project and test engineer, Jacobs Aircraft Engine Co., Pottstown, Pa. He was with International-Plainfield Motor Co., Plainfield, N. J., as a mechanical engineer.

SELDEN T. WILLIAMS, formerly superintendent of the Schrader Brooklyn factory, was recently elected vice-president in charge of manufacturing operations in all plants of A. Schrader's Son Division, Scovill Mfg. Co., Inc.

Selden T. Williams

ARNOLD D. NICHOLS, formerly mechanical engineer, Waterbury Tool Division, Vickers, Inc., Waterbury, Conn., is now an engineer for Autoyre Co., Oakville, Conn.

CHARLES F. KETTERING, head of the research laboratories of General Motors Corp. and a past-president of the SAE, was recently elected president of the American Association for the Advancement of Science, the largest scientific organization in the world.

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OBITUARIES

William Knight

William Knight, recently named continental director of organization, Technocracy, Inc., died Dec. 26 at the age of 64. For the past two years he had been associated with Curtiss-Wright Corp. as inspection methods engineer in the Propeller Division.

Well-known as a writer of aeronautics, Mr. Knight was born of British parentage at Naples, Italy, and was graduated from the Royal Italian College of Mechanical Engineering in 1900. After serving in the Italian Navy for three years, he took an engineering degree at the University of Naples. In 1910 he came to the United States, working for General Electric Co. and then Crocker-Wheeler Co., until the outbreak of World War I when he served as a first lieutenant in the U. S. Army Air Corps.

Mr. Knight did much liaison work with the French and Italian Governments, and represented the German aircraft firm of Junkers Corp. as vice-president and director of the company. A former associate editor of *Aerial Age* and *Radio Merchandising*, Mr. Knight is the author of "Stresses in Disc Wheels," appearing in this issue's Transactions Section.

Max Stupar

Max Stupar, head of industrial planning, Bell Aircraft Corp., and a pioneer in airplane development, died recently. He was 59 years old.

Mr. Stupar built and flew his own airplane in 1910, and that same year established the Stupar Air Works in Chicago. During the first World War he was assigned by the U. S. Government to fill various positions, one of which was to organize the Wood Inspection Division, and he won over $45,000 in prizes offered by the Army and Navy for excellence in aircraft design.

He joined Curtiss Airplane Corp. in 1926, where he organized the production engineering, tool design and estimating departments of the company. In 1940 he came to the Bell organization, and innovated the moving line type of producing aircraft there.

Clifford C. Rensing

Clifford C. Rensing, 42, an engineer on the staff of Aluminum Industries, Inc. since 1929, died recently. Mr. Rensing, who was born, educated and made his career in Cincinnati, had been employed as a draftsman and designer before practicing engineering at Aluminum Industries.

He was a graduate from the University of Cincinnati.

Technical IDEAS for ENGINEERS

Briefed from Papers Given at SAE Meetings

REFRIGERATION OF TRUCKS CALLS FOR GOOD ENGINEERING

by GEORGE JACKMAN
Public Service Garage Co.

▪ Spokane Group, Nov. 10

(*Excerpts from paper entitled "Truck Refrigeration"*)

SINCE we have been refrigerating by one means or another for at least eight years, we have encountered many problems before arriving at our present system.

We have found that good insulation plays a very important part in successful truck refrigeration, and the best insulating method is enclosing kapok or similar material in moisture-proof, paper-forming bats. These bats are then fastened on the ceilings and sidewalls before the inner plywood is put in place. At least 5 in. of this insulation are required on the ceiling and 3 in. on the sidewalls. In constructing the floors, we use 4 in. cork and a layer of ¾ in. plywood; then a layer of foil paper with a ¾ in. hardwood floor laid diagonally on top of this.

In construction of the body, the outside skin should have no direct metal contact with the inside of the box. One of the greatest losses of refrigeration comes from rear doors, since it is almost impossible to keep them in shape.

Types of Refrigeration

We tried many kinds of refrigeration before arriving at our present setup. First we used dry ice in a container made of hardware cloth, and these were fastened to the ceiling. This was unsatisfactory since the temperature could not be maintained at the desired degrees. Next, we tried dry ice and alcohol. This consisted of a coil through which the alcohol was circulated by means of a thermo-syphon system. By using a fan behind the coil warm air was forced through it, warming the alcohol and causing it to rise. The alcohol which had been cooled with dry ice then flowed into the coil, replacing the warm alcohol. While this method worked more successfully, we still could not maintain the desired temperatures.

Our third attempt was using cold hold plates, which required four 4x5 foot plates for each box. The disadvantage of this method was weight, and of course, there was no protection in case of road failures, since the plates were good for only about 12 hr.

We then built several gasoline plants, which were successful in that we had some control over the temperature. We now use full automatics on trailers and semi-automatics on trucks.

Maintenance Problems

To operate these motors satisfactorily, it was necessary to use a straight white gas with no leading whatsoever.

The most common reasons for these units not cooling properly are: (1) They are not properly defrosted. We keep our compound pressure gage in operation as it is the only means of knowing accurately what the unit is doing and when to defrost. Whenever in doubt, we place an accurate thermometer in the box and check it. We try to keep our temperature between 34 to 38 deg. With the temperature at these degrees when the gage reads 0 to 3 lb, the unit is in need of defrosting. We defrost after the product is loaded and about every 5 hr thereafter on the road. (2) Improper loading of the van. The load should be placed so that it does not choke the airstream in the box. (3) Dirty condenser. (4) The unit may be out of refrigerant, or some part of the system may be clogged. The greatest source of trouble in the loss of refrigerant is the compressor seal and failure of vibrasorber which is a flexible connection between compressor and coil.

We have installed a refrigerator department to maintain and service our 52 units. In this department we have a large bake oven for drying our complete unit – and in doing this, we have very little trouble with moisture when rebuilding.

Inadequate Dollar Structural Values Handicap Use of Newer Materials in Car Manufacture

Mohawk-Hudson Group, Dec. 12

(*Summary of talk by SAE Past-President W. S. James on "The Post-War Car"*)

PREDICTING that iron will continue to be used as the major material in automobiles rather than more expensive plastics, aluminum, or magnesium, SAE 1944 President W. S. James told the group attending the Mohawk-Hudson Group on Dec. 12 that more structural value per dollar can be obtained from iron.

Pursuing the subject of lighter materials and costs, Mr. James suggested that cubic-inches-per-dollar is a useful figure in considering economic cost in terms of the utility or usability of the material. This unit of measurement, he said, can be applied regardless of the disposition of the material, whether in circular section for torsion, channel or I-beam for bending, when *structural* determinations are being made.

Mr. James used the following tabulation to illustrate his concept:

	Cu in. per \$	Modulus of Elasticity
Iron	143	29
Aluminum	71	10
Magnesium	130	6½
Plastic	15-150	0.6-6

The combination of modulus of elasticity together with cubic inches per dollar is a good indication of the economic usability factor, structurally, he maintained.

Other observations made by Mr. James on the post-war car were:

1. There will be no experimental cars sold to the public, as only thoroughly tried and developed automobiles will be on the market.
2. Hundred-octane fuels may not find a place in the motor-car field until about 1960.
3. On the basis of 50,000 miles of operation over a two-year period, a pound of weight in a passenger car is worth 20¢ from the standpoint of fuel economy.
4. The so-called artistic touch is likely to add violently to the cost of the car.
5. Regarding flexibility of various types of motive power, if the turbine or any type of engine is considered from the standpoint of replacing the present internal-combustion engine, it must be able to compete with the 10-1 speed range of present engines. In other words, the present engine will operate smoothly from 8-80 mph without change of gears. Mr. James stated that the automobile engineer would like to have an exhaust-driven engine supercharger for about \$1.50 to compete with the carburetor and to help in boosting performance of our present engine along with increased compression ratio.
6. The fluid clutch is a valuable and interesting member of the automobile transmission. The hydraulic coupling has very definite possibilities as a clutching mechanism; but as a transmission it is a step backward on account of friction losses. A hydraulic clutching member should be set up in the transmission so that it can be locked out when not performing its duties as a clutch. B.T.U. losses mean fuel losses.

COMPRESSIBILITY MADE DESIGN FACTOR OF HIGH-SPEED PLANES

by G. S. SHUE
Consolidated Vultee Aircraft Corp.

■ San Diego Group, Sept. 19

(Excerpts from paper entitled "Compressibility")

COMPRESSIBILITY becomes increasingly important as the speed of an aircraft exceeds 300 mph, and when speeds in excess of 400 mph are desired, it is the foremost design consideration. This is true because the local speed of the air flowing around various parts of an airplane is then equal to or greater than the speed of sound.

"Mach" Number

The speed of sound is such an important item that it has been found convenient to name the quotient of the flight speed and the speed of sound. Thus, we have the "Mach number." The critical Mach number is reached when the air attains the speed of sound at some point on the airplane. The most significant effects of compressibility are:

1. The slope of the lift curve increases with an increase of speed up to the critical Mach number; then, at supercritical Mach numbers, it decreases with increasing speed.

2. The drag coefficient remains practically constant at subcritical Mach numbers and then increases rapidly as the critical Mach number is approached and exceeded.

3. The pitching moment may increase, decrease, or remain the same when the critical Mach number is reached.

4. When the critical Mach number is exceeded shock zones are formed in the air stream. A shock zone is a narrow region at right angles to the airstream, across which the air suffers an abrupt decrease in velocity. The shock increases in intensity and moves rearward on the airfoil as the speed increases.

5. Both stability and control of an airplane are affected by compressibility. The tail critical Mach number is usually higher than the wing critical Mach number, and this combination has been such that the stability of an airplane at high speed increases to several times the low-speed value, and the control forces become exceedingly large.

The speed of sound in air depends only on the temperature and it is proportional to the square root of the absolute temperature. At 60 F this speed is about 764 mph, but at –60 F it is only 670 mph. Therefore, at higher altitudes, where the air has low density and offers less drag at a given speed, it is easier to reach the critical Mach number because the speed of sound is considerably lower. This is particularly detrimental to military aviation.

Figuring Speed of Sound

The quantitative prediction of the behavior of an airfoil at high speed has not been very successful up to the present time. The commonly used correction factor is that of Glauert, $1/\sqrt{1 - M^2}$ where M is the Mach number. This factor represents the ratio of the compressible and incompressible pressure coefficients. It is on the basis of this equation that the speed of sound is selected as the limiting speed, since a value of M in excess of unity makes the quantity imaginary.

Von Karman and Tsien obtained an equation which is a better approximation than the Glauert one, and it is usually given in the following form:

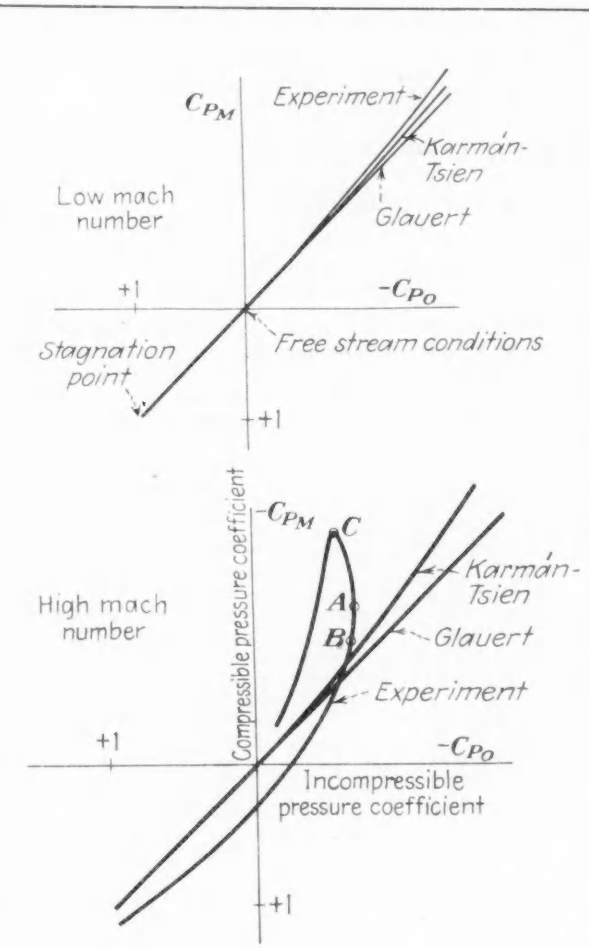
$$C_{PM} = \frac{C_{P_0}}{\sqrt{1-M^2} + \dfrac{M^2}{1+\sqrt{1-M^2}}\,\dfrac{C_{P_0}}{2}}$$

where C_{PM} is the compressible pressure coefficient and C_{P_0} is the incompressible pressure coefficient.

In Fig. 1 the relationships of C_{PM} and C_{P_0} are shown for the Glauert, Karman-Tsien, and for experiment at both low and high Mach numbers. The curves for the low Mach number represent conditions where the local air-speed is always less than the speed of sound. The curve for the high Mach number represents the condition in which the local air speed is supersonic during a portion of the flow over the airfoil. In either curve, the lower left end denotes the stagnation point, while the origin represents free stream conditions and the upper right quadrant indicates the portion of the flow in which the local speed is greater than the free stream speed.

At point B the local speed of the air is equal to the speed of sound. At point A the maximum speed without shock has been reached, and if this speed is exceeded, a shock zone will be formed at some point downstream when the air is decelerating. Point C represents the peak velocity and following it, the speed drops almost instantly to a subsonic speed. This is the shock zone.

High-speed wind tunnel tests are considered to be the most reliable basis for estimating the effects of compressibility on performance. Such tests should be compared with flight experience in similar cases and revised accordingly.



■ Fig. 1 – The relationships of C_{PM} and C_{P_0} are shown for the Glauert, Karman-Tsien, and for experiment at both low and high Mach numbers. The curves for the low Mach number represent conditions where the local air speed is always less than the speed of sound. The curve for the high Mach number represents the condition in which the local air speed is supersonic during a portion of the flow over the airfoil

Flight Safety Demands Multiple Engines For Air Transport Planes

by MARVIN J. PARKS
Curtiss-Wright Corp.

▪ 1944 National Air Cargo Meeting

(Excerpts from paper entitled "Cargo Airplane Accessories")

THE most efficient cargo airplane would be one designed to use the largest powerplant available, and only one; but since we must still maintain safety of flight for the security of our crew and shipments, we are forced to go to multi-engined equipment.

Jet exhaust stacks can be used to even greater advantage on the cargo plane, since we are not concerned with cabin noise. Carburetor de-icing and propeller anti-icing will be substantially the same for dependability of all-weather scheduling.

Heat and Boots Methods

Considering surface de-icing, there are two commonly accepted methods – heat and boots. If heat is employed, the auxiliary heating plants now used have considerable merit. The ability to use jet stacks is simplified, and they offer an interchangeable feature since they can be tested singly or in multiple units. So long as they are not a part of the cabin heating system, they can also be removed with weight-saving benefits when climatic conditions permit. The de-icer boot offers these benefits to a greater degree, as it constitutes practically the entire weight of this latter system.

Pilot's Demands Unchanged

Viewing accessories from the pilot's angle, there will be little change from a passenger airplane. He will require the same instruments, radio facilities, soundproofing and heat of the passenger plane to conduct his job accurately. His food could be carried personally in a special thermo container, and for long hauls, an auto-pilot would possibly be usable. Simple facilities in the form of a chemical toilet should also be provided.

The amount of insulating and heating facilities can best be determined by the operational characteristics of the particular geographical system and cargo handled. Information now available indicates that an airplane the size of the Curtiss Commando can adequately meet the requirements with 298 lb of insulation and heaters with a combined total capacity of 250,000 btu. This takes care of the cabin, cockpit, and windshield de-icing.

The distribution loading of cargo, as far as weight is concerned, should not present a CG. problem, and, as a matter of interest, our cargo plane can be loaded with practically no regard to location of weight. A new device called the "Springilizer" allows for greater travel, extending the stability range far beyond that possible heretofore.

Our present designs with present accessories will make it possible to load cargo airplanes as rapidly as we now load passengers in our fast transport airplanes. If, however, we are ever to realize the now visualized cargo rates of the future, we will have to keep airplanes in the air, minimizing ground time. This can best be accomplished by setting up our terminals to handle the equipment to be used. If, for instance, we can have a more efficient cargo airplane with a low-wing with resultant high-loading platform – then, let us take the high platform and build our loading dock to accommodate the situation.

Accessories for loading and unloading cargo planes from a dock can be simple. For example, we can have our docking section on an elevator, and as cargo planes of varying floor heights are serviced, the platform of the docking section can be altered to the occasion. The loading dock can be visualized from various angles – it can be strategically located to form a pattern for loading areas; or we might roll out a section of the dock to the plane and load directly on or from a truck pre-located on the mobile section. The height of the truck could be prearranged by using sectional elevated troughs for the truck to back up on.

The center section of our depot could conceivably house scales so that the truck with its load could be weighed, thus eliminating rechecking each individual shipment to get the gross station shipment for computing the airplane's payload.

Eventually, we can expect simple spring gages that will automatically give us both the CG. and the airplane's gross weight. This reading will be transmitted to a single instrument that the stevedores or pilot crew can check at random.

AIR CARGO MAY REVOLUTIONIZE DISTRIBUTION, CREATE MARKETS

by J. A. WOOTEN
American Airlines, Inc.

▪ 1944 National Air Cargo Meeting

(Excerpts from paper entitled "Manufactured Goods Including Merchandise")

POORLY designed equipment for transportation of cargo limits the selling field to new commodities, in new packages, to be merchandised in new methods, in new markets. The average density of manufactured merchandise exceeds a specific density, when packed for shipment, of 20 lb per cu ft, but we cannot hope to invade this field seriously when our equipment has a designed density of 4 lb per cu ft.

Drugs, medicines, chemicals – are merchandise. Considering only the drugs within the drug list, these items have a specific density of 27½ lb per cu ft. They also have an average sale price of 59¢ per lb. If the largest drug chain in the United States made 10% profit on their annual sales, their stock would be the best buy on the market – about 6¢ per lb. Their average cost of transportation from New York City to the West Coast at present is less than 4¢ per lb, but by having to charge them 40¢ per lb, we cannot expect to get any business. Yet these drugs definitely possess an airfreight potential.

Lower Rates Suggested

It is certain that our accomplishment will be decidedly limited unless we can drastically reduce our rates. If we can offer the public a rate of 15¢ per ton mile, then we would suggest that airfreight shipment have the following characteristics:

1. A specific density that would average, from a rate standpoint at least, 20 lb per cu ft.

2. A value at origin that would not average more than 50¢ per lb.

3. Commodities that would be easily stowed, with an average volume per shipment, in less than planeload quantities, of 250 lb; with an average volume per shipment in planeload quantities of 4 to 5 tons.

We will get large amounts of magazines at 15¢ per ton mile. We can then do tricks with manufactured in addition to style merchandise at 15¢ per ton mile. On many items it is possible to move the plant away from consuming centers, as New York or Chicago, and put the plant on top of the source of basic material. Through the use of air transportation we can serve the United States as a market satisfactorily from a given point. We might even possibly supply the retail outlet direct from the manufacturer, permitting the retail outlet to merchandise on what is called "sample stocks," drawing upon air transportation for daily replacement. Of course, this can be done at 40¢ per ton mile for some few new commodities.

Old Tools Hamper Progress

Give us a plane that can be placed against the platform so that the loading operation can be continuous, allowing us to cut these surface costs at least to the level of our competition. The only thing we have to sell in air transportation is speed – and speed is only important when it is converted into useable terms. Through the use of airfreight, the minimum package required is the best package. Therefore, the most fragile commodities can be transported safely in airfreight if they can be properly loaded and unloaded. These shipments are hampered today, however, by antiquated tools.

Everything that moves by airfreight should receive, as a result of moving through the air, an added value, but the tool we have now will not permit us to create this value except for a limited number of commodities. The Passion Fruit in Orange County, Calif., is worth $4 per ton; in New York City it is worth $700 per ton. For every perishable fruit or vegetable, there is a perishable manufactured commodity as well.

Anything that will move via the air is "hot." If people pay for air transportation, they want service.

Devise Simplified Method Of Finding Data on Vibration

by FREDERIC P. PORTER
Fairbanks, Morse & Co.

▪ 1945 Annual Meeting

(*Summary of paper entitled "Methods for Calculating Torsional Vibration"*)

A COMPARISON of two well-known methods of calculating the natural frequencies of complex shafting systems was presented by F. P. Porter, chief design analyst of Fairbanks, Morse & Co., at the 1945 Annual Meeting in Detroit.

The concentrated-mass equivalent system, which uses the Holzer table, is compared with the reduction method developed by the author, in order to demonstrate the general procedures used with each method and also to show the considerable reduction in arithmetical work resulting from the use of the reduction method.

Savings Possible

For instance, the author points out in one of his examples that more than 200 numerical operations and the use of six or seven Holzer tables are required to obtain the first two natural frequencies if the concentrated-mass equivalent system is used. If the reduction method is used to obtain the frequencies, however, only two or so numerical operations and reference to one table are required. Similar savings are affected with more complicated systems, or when higher frequencies must be determined. Results of either method are practically the same.

This paper by Mr. Porter, "Methods for Calculating Torsional Vibration", will eventually form part of the final report to be issued by the SAE-W.E.B. Torsional Vibration Committee, of which Mr. Porter is a member.

The work of this committee is being done for the U. S. Navy at the request of Capt. L. F. Small, then of the Bureau of Ships, who suggested the problem to the SAE because of the Navy's difficulties with torsional vibrations in propeller shafts and crankshafts. The work is being continued under Capt. Small's successor, Capt. Thomas G. Reamy, USN, whose assignment embraces all diesel-engine development programs for the Navy. The captain has served at sea on submarines, and has had shore tours in engine design, inspection, and submarine fitting, since his graduation from Annapolis in 1925.

A discussion of the Navy's torsional vibration problem was presented by Capt. Small on pp. 24-25 of the September, 1944 *SAE Journal*.

Former Methods Unsatisfactory

In the past, two solutions have been used – increasing shaft size arbitrarily, which means an increase in weight, always a critical factor in submarines; or avoiding critical speeds in operation, an even less satisfactory solution.

While numerous methods and instruments had already been developed for the measurement of torsional vibration, they had all required highly trained specialists for their operation. Consequently, the committee is trying to develop measuring methods suitable for use at the point of engine operation by personnel that is not highly trained.

The initial progress report of the committee, issued in April, 1944, covers a survey of present techniques for measuring amplitude of torsional vibration.

Members of the committee besides Mr. Porter are: C. G. A. Rosen, Caterpillar Tractor Co., chairman and sponsor; L. M. Ball, Chrysler Corp.; T. C. Van Degrift, General Motors Research Laboratories Division.

Complete copies of the paper by Mr. Porter are available from the Society's headquarter's, 29 West 39 St., New York City 18, at a cost of $0.25 to members and $0.50 to nonmembers of the Society.

Periodic Maintenance Promotes Centralized Control and Policing

by W. A. TAUSSIG
Burlington Transportation Co.
Western Michigan, Sept. 21

(Excerpts from paper entitled "Bus and Truck Powerplant Periodic Maintenance")

THE greatest advantage of periodic maintenance is to permit policing the activities of many scattered shops from one central point. In our organization, copies of inspection reports of all major inspections are forwarded to the head office in Chicago, where the mileage at which the next inspection will be due is calculated and entered on a wall chart.

The second benefit is the effect on the morale of the mechanical organization. Each of our shops is provided with a large blackboard, a duplicate of the wall chart, and it is the duty of the shop foreman to keep his blackboard properly posted. By this means he plans his work daily, and the entire personnel can see what inspections are past due, how many are past due, and how many miles overdue. It becomes, therefore, their score board by which to judge their record of work.

Periodic maintenance also provides a means of detecting weaknesses before failure occurs. Reduction of maintenance costs may result from such maintenance since it may disclose the necessity of replacing inexpensive parts in order to avoid resultant destruction of more expensive parts.

Engine Types Compared

Considering all costs which are properly attributable to an engine, namely, fuel, fuel tax, lubricating oil, lubricating oil tax, and maintenance, in the first half of 1943 we had a cost per 100 miles of $2.63 for the diesel and $4.33 for the gasoline engine. The cost per mile for the diesel was therefore 1.7¢ less than for the gasoline engine. On approximately 7,300,000 diesel miles per year our diesels saved about $124,100 as compared to gasoline engines.

Wartime conditions have adversely affected this situation. Taking the total costs attributable to the engine during the first half of 1944, the cost per mile for the diesel was 3.99¢ as compared to 4.84¢ for the gasoline engine. Thus, during 1944 our diesels have saved us only $62,050 as compared to $124,100 during 1943. Our saving has been cut exactly in half.

Most long distance operators find that the successful operation of an engine is primarily dependent upon the cooling and lubrication systems, on which far too little attention has been given. There is a manifest necessity for larger and sturdier radiators, improved mounting of radiators, and a more positive type of water-tight connection to connect hoses, radiators, engine, and so forth. Another item that should be given consideration is the possible use of variable pitch fans thermostatically controlled.

A better method should also be provided to permit the driver to ascertain the liquid level in the cooling system, such as the use of petcocks or sight glasses. These devices would prevent overfilling and would assist the driver in maintaining the correct level.

With reference to the lubrication system, one of the greatest needs is to improve the accessibility of the oil distribution system so that it may be readily cleared of coffee grounds and other obstructions, and so that visual inspection can assure that they have been properly cleaned.

All engines engaged in severe long-distance operation should be equipped with a well-designed, properly functioning oil cooler. Also, engine parts must be made more accessible. I believe that the decorative design of freight trucks and tractors has contributed more toward the inaccessibility of engines than has any other consideration, and this in turn has contributed to staggering operating costs. It has become necessary now to provide an economical and efficient prime mover of freight, and to pay less attention to the appearance of the package in which it is wrapped.

Limiting Factors in Engine Life

In a well-maintained fleet, engines are periodically overhauled and placed in a condition which is almost as good, if not better, than when it left the factory. By undergoing continuous overhauls, few original parts remain, and under these circumstances the life of the engine becomes in-

finite. The only justification of scrapping an engine that has been maintained in this manner is the consideration of obsolescence.

Engine life can also be construed as the interval between its production and complete overhaul or rebuild. On most engines, the limiting factor is the crankshaft and timing gears or timing chains. Most of the other parts, while not stronger, can be removed and replaced without the necessity of removing and dismantling the entire engine. Unquestionably, each type of engine and its application has a different set of factors which influence the relative life of its various parts.

APPLICATIONS Received

The applications for membership received between Dec. 10, 1944, and Jan. 10, 1945, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: Capt. Edgar H. Berg, Peyton M. Magruder, Harold E. Roe, John Till.

Buffalo Section: L. C. Bates, Andre D. Hodge, Linus J. Rausch.

Canadian Section: Erik C. Maa Leonard Wakeford.

Chicago Section: Charles J. Boyd, W D. Carlson, J. K. Dickey, Harold D. Elli Joseph Snelson Francis, William W. Henning, Willis Abbott Johnson, Edward C Myers, Ralph E. Powers, Carl A. Ruesenberg E. J. Tompkins, Robert H. Wellman, Perry A. Wood, Jr.

Cleveland Section: Dwight M. Allgood, Henry E. Alquist, Stanley P. Bayles Harold E. Friedman, Arthur D. Glaze Charles Vincent Harvey, J. Robert Henry Donald George Hilligoss, Everard Franc Kohl, Grant W. LaPier, Vincent Lawrenc LaValle, Dana Willis Lee, Frank Lou Mauro, Benjamin Pinkel, E. H. Recker, H Lesle Rittenhouse, Harold Shames, Charle L. Smythe, Cleveland C. Soper, Ray W Wellenberg, John Wischhusen, Arthur E Zimmerman, Merritt A. Zimmerman.

Detroit Section: George B. Abbott Lester L. Beltz, Charles O. Bickert, Har L. Brinck, David Scott Burnett, Lyle E Calkins, Fred W. Carr, J. W. Duhn, Lou B. Forman, Garnett H. Gallaway, Roland E. Gegoux, Ronald K. Hatch, W. H. Hammond, R. B. Harvey, Herbert L. Hornbeck Sigmund Kloniecke, Howard H. Locher Clarence R. Lunn, Thomas F. McGuane Jr., John McLean, Raymond J. Nymberg Peter W. Perish, Henry T. Scott, Francis J Sehn, Frank E. Wickham.

Indiana Section: James William Bal Philip R. Clements, Glenn D. Dickerson William I. Gorrell, Howard W. Meyer, Ma B. Millet, William F. Shirley.

Metropolitan Section: Eugene Frederick Baird, William J. Bott, Vito Colamartino, Michael G. Danias, Henry L. Gasbarre Geoffrey Gilbert, Leonard C. Hillmuth, Otto J. Kammerer, Jack M. Lipman, Lt. Theodore P. Mayer, Albert J. Miller, Archibald T. Miller, Arthur W. Miller, Howard E Nehms, Edgar Wikner Percival, Rene Lou Rocher, Matthew J. Ryan, Hyman S Schwartz, James H. Sharp, Marvin Stern Bert J. Sundberg, Charles Suntag, Jeremiah F. Toomey, James W. Wheeler, John C Zjawin.

Mid-Continent Section: D. W. Given A. L. Haskins, Lt. Edwin E. Kuclein, A. L McClelland.

Milwaukee Section: John T. Rettaliata

Mohawk-Hudson Group: Eugene Be hun, Gene O'Haire.

New England Section: Robert T. Hol-d, W. F. Ma..., Edwin I. Ofgant.

Northern California Section: Wil-... C. Balmann..., Edward Lamory Kear-..., John W. Ro...n.

Northwest Section: John E. Allan, ...d George Heiderer, Asa LeRoi Pierson, ...rence M. Wynn.

Oregon Section: Roy C. Howard, Wal-... L. Wagner.

Peoria Group: Paul B. Benner, Theo-...re Dewey Guile, Ivan E. Howard, Wil-...n E. Irwin.

Pittsburgh Section: Equitable Auto ..., Charles F. Hammer, Joseph Kinney, Jr.

Philadelphia Section: Walter Allison ...kie, Alexander Sherman.

St. Louis Section: Walter E. Lang, ...is W. Phipps, Robert B. Semple, Gran-...le Avery Waters.

Salt Lake City Group: Albert Theo-...re Watanabe.

Southern California Section: Ralph ... Birnbaum, John F. Crane, Robert H. ...vid, Alfred E. Doherty, Robert Arnold ...rrison, William Hangliter, William J. ...ggins, Chester Eugene MacMasters, Lewis ... Massie, Henry A. Powis, Stewart W. ...rdy, Kenneth W. Schmidt, Kenneth C. ...ith, Clifford E. Smyser, Walter C. Hurty.

Southern New England Section: ...lliam Henschke, Robert H. Gibson, Sid-...y E. Miller, Paul E. Morgan, H. M. Sauers.

Southern Ohio Section: Lawrence Eu-...ne Balch, D. D. Brubaker, James Russell ...y, Howard E. Rehnborg, Hugh C. Rob-..., Maurice W. Shayeson.

Spokane Group: J. C. Jameson, Wil-...m H. Kinzel, Alfred T. LeMieux, Henry ... Wick.

Texas Section: Paul G. Crawshaw, J. C. ...mondson, Capt. Bartholomew C. Loskot, ...n F. Stewart, Clyde A. Watkins.

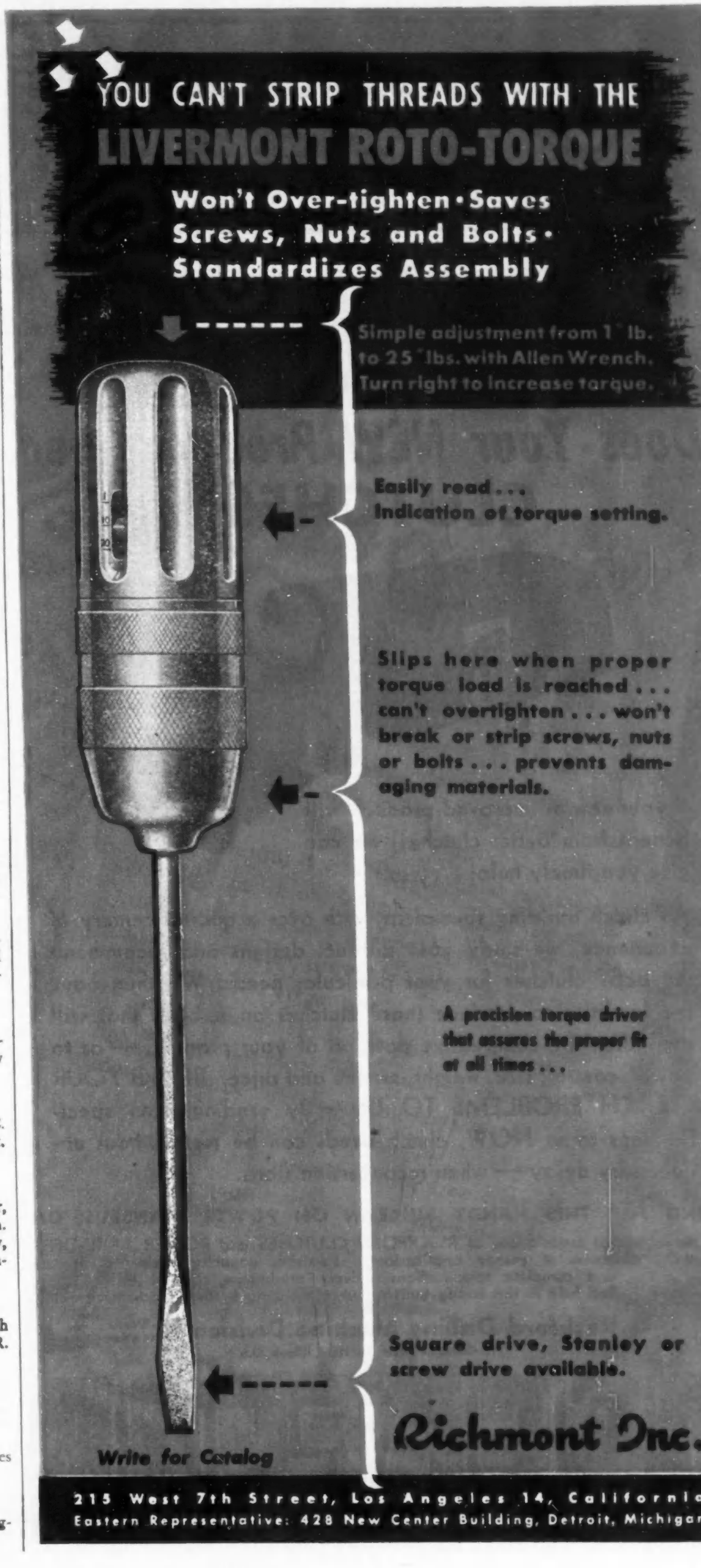
Washington Section: James F. Angier, ...jor George Walker Gilmer, 3rd, Lt.-Com. ... E. Krogstad, Capt. Russell H. McGuiney, ...ph Wimmer Stout, Jr., Leonard Hern-... Witt.

Western Michigan Section: Kenneth ... Christensen, Vincent M. Drost, Willis R. ...nson.

Wichita Section: Lt. John B. Cole.

Outside of Section Territory: Charles ... Starr, Jr.

Foreign: William Lewis Morgan, Eng-...d, Keith Livingstone Swift, Australia.



NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Dec. 10, 1944, and Jan. 10, 1945.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Joseph A. Sciortino (A).

Buffalo Section: Charles Vernon Brack (J), Paul F. Groves (J), Thomas C. Murray (J).

Canadian Section: Robert Watson

Coats Borland (A), Hector William F... (M), Francis R. Russell (A).

Chicago Section: James W. Brow... Harold Wm. Browall (M), Edward ... Cygan (J), Charles P. Graddick (A), ... W. Harnach (J), Zdenek J. Lansky ... Joseph H. Reed (A), Alexander Ro... (M), Samuel D. Ruby (A), Larry R. S... (A), G. S. Staunton (A), Bruno E. S...bart, Jr. (J) Richard Fred Voelz (J), ... J. Zink (M).

Cleveland Section: Thomas R. ... (M), William A. Fleming (J), Cliffor... Salow (J), John D. Stanitz (J), D... Louis Wadsworth (M).

Colorado Group: Alexander R. ...christ (A), Chauncey W. Olson (A).

Detroit Section: William M. Ale... (A), Werner G. Baule (M), Robert D. ... (M), Herman M. Canner (J), J. Edwin ...lier (M), Walter C. Doutt (M), A... Evans (M), Merritt D. Hill (A), Ray... J. Hodgson (A), Lorin B. Kruse (M), ...ert B. Macgregor (J), Meyer Louis R...berg (J), J. Milton Shatzel (M), Stu... Smith (A), Sydney L. Terry (J), Melv... VanSickle (M), Carroll L. Walker, Jr.

Indiana Section: Forrest W. McM... (A), Charles W. Messersmith (M), R... H. Short (M).

Kansas City Section: John A. F... (M), Robert J. Schroers (J), Charles W. ... Rosenberg (M).

Metropolitan Section: Umbert G...dassarri (J), Keith E. Benson (A), Pe... Florez (J), Edward Eli Ernst (J), Jo... Giovannetti (M), Sergei G. Guins... Charles Guthy (A), R. Thomas Ha... (M), Creighton M. Lawhead (J), ... Mendelson (J), Dr. Walter M. Mitchell ... Reginald L. Rickett (M), Herbert E. S... (M), Bernard Weinstein (J), Harvey L... Williams (A).

Mid-Continent Section: Ralph O... Flugel (A).

Milwaukee Section: James A. ... (M), Farrell D. Biddle (M), Charles ... Finkl (J), Earl H. Kidd (J), Ross H. P... (M), Gerald Robechaud (M), Gus San... (A).

Mohawk-Hudson Group: David J... nawit (M).

Northern California Section: L... William H. E. Elgar (A), Frederick ... Hanson, Jr. (J), Ensign David Jukoff ... Jack A. Wigholm (A).

Northwest Section: Lawrence ... Wright (A).

...gon Section: Seth A. Marks (A), ...-Willamette Co. (Aff.), Reps: Em... Earls, Gratten D. Keerins, Alden W. ...e, James M. Neal, H. E. Shillander, ... Stigum. Ensign Herbert L. Tollisen, ...).

...ladelphia Section: John Charles ... (J), Ensign Glenn Edward Herz (J), ... Myhre (A), Herbert Arthur Petty (J).

...ttsburgh Section: Leslie C. Borell ... W. Coyle Cochrane (A).

... Louis Section: Steven Schnell (M).

...t Lake Group: Glen H. Page (A).

...uthern California Section: Kaj. ...e (A), Julius H. Blohm (A), Samuel ... Cairns (A), S. Leroy Crawshaw (M), ... B. Eastburn (A), Henry C. Ince (A), ...r Theodore Larke (J), A. A. Suggs ... Glynn Williams (M).

...outhern New England Section: ...ur C. Fletcher (J), John R. Foley (J), ...t G. Merkel (A).

...uthern Ohio Section: Donald W. ... (J), Everett D. Stephens (J).

...racuse Section: Lee Ashby Benson, ... (J), Nevin S. Focht (M), Wallace J. ...re (M).

...xas Section: Bellvin Jay Anthis (J), ...h Cohen (A), Ben J. Cumnock (J), ... Eaton Goodridge (A), J. Wallace ...hes (J).

...win City Group: Charles E. Bodey, ... (J), Clayton W. Harrison (A), Martin ...ning (M).

...ashington Section: David Feigen-...m (J), Alex. Petrovsky (J), Valdo Frank ...son (A).

...estern Michigan Section: Herman ... Stapel (J), Lyle L. Stringham (M).

...ichita Section: Avery C. Maloney ...).

...utside of Section Territory: Olaf ...lter Andersen (A), Robert Emmett An-... (J), Ensign Russell Frank Apitz (J), ...mer B. Black (M), Fl. Lt. Stephen ...menthal (J), Albert L. Brucklacher (J), ...ell L. Fenn, Jr. (A), Michael Charles ...pes (J), Harry Louis (J), Levertt A. ...Donell (A), 1st Lt. Kenneth E. Yates (J).

...oreign: Osman Shafik (F M), (Egypt), ...nalal G. H. Shah (J), (India), Geoffrey ...illiam Sonnen (J), (England).

About SAE Members

cont. from p. 36

B. ALLISON GILLIES has resigned as vice-president of Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y., and will devote himself to consulting engineering work.

G. D. SICKERT is now associated with Bolens Products Co., Port Washington, Wis., as chief engineer. He had been plant engineer, Perfex Corp., Milwaukee.

CHARLES A. WORLEY, formerly processing engineer, American Propeller Corp., Toledo, Ohio, is now with Buckeye Traction Ditcher Co., Findlay, Ohio, as processing and tooling engineer.

D. P. C. NEAVE, formerly assistant general manager of operations, Mond Nickel Co., Ltd., London, England, is now joint managing director, Imperial Smelting Corp., Ltd., same city.

L. L. ASPELIN, who had been chief engineer, Romec Pump Co., Elyria, Ohio, has joined Thompson Products, Inc., Cleveland, as assistant chief development engineer.

E. B. OGDEN is now connected with Pacific Intermountain Express Co., Salt Lake City, Utah, as assistant superintendent of maintenance. He was formerly shop superintendent, Consolidated Freightways, Inc., Spokane, Wash.

CHARLES A. POTTER, formerly West Coast aviation representative, Texas Co., Los Angeles, is now service engineer, Wright Aeronautical Corp., Paterson, N. J.

WARREN M. MERRILL has been appointed an engineer of General Engineering & Design Co., Detroit. His former position was superintendent, Peninsular Tool & Die Co., same city.

ROBERT I. MINER has left Ryerson & Haynes, Inc., Jackson, Mich., where he was chief engineer, to become affiliated with Sparks Withington Co., same city.

DONALD W. WING, previously supervisor of apprentice training, Tractor Works, International Harvester Co., Chicago, is now in the U. S. Army, stationed at Fort Bliss, Tex.

SAE members who have received recent changes in company status include: **ALDEN P. THOMAS,** Timken Roller Bearing Co., Steel & Tube Division, Canton, Ohio, from mechanical engineer to experimental development engineer; **GARY C. WILSON,** Sinclair Refining Co., Atlanta, Ga., from lubrication engineer in the railway department to assistant to the lubricating manager; **ROBERT H. WOLFF,** LeRoi Co., Milwaukee, Wis., from chief inspector to quality control engineer; **DAVID M. LITTLE,** Minneapolis Honeywell Regulator Co., from senior test engineer, Aeronautics Division, to design engineer; **EDWARD N. COLE,** Cadillac Motor Car Division, GMC, Detroit, from project engineer to assistant chief engineer.

Also, **LOUIS DROBECK,** Chevrolet-Gear & Axle Division, GMC, Detroit, from quality engineer to chief production checker; **WILLIAM H. YENNI,** Joseph Weidenhoff, Inc., from chief engineer and vice-president in Chicago to branch plant manager in Neillsville, Wis.; **FORREST L. DORMAN,** Curtiss-Wright Corp., Propeller Division, Caldwell, N. J., from vibration engineer to assistant project engineer; **ALEC H. HARVEY-BAILEY,** Rolls-Royce, Ltd., Derby, England, from defect investigation engineer to technical officer, Repair Division; **BERNARD F. IRWIN,** Lockheed Aircraft Corp., Burbank, Calif., from research engineer to project coordinator; **HOWARD S. CURRIER,** Oldsmobile Division, GMC, Lansing, Mich., from experimental manufacturing engineer to administrative engineer.

Also, **WILLIAM S. WATTS,** Elastic Stop Nut Corp., Union, N. J., from product engineering supervisor to chief product engineer; **SIDNEY J. WILLIAMS,** National Safety Council, Chicago, Ill., from director of the Public Safety Division to general manager; **T. A. KREUSER,** Bendix Aviation Corp., South Bend, Ind., from staff assistant to the general manager to service sales manager; **FRANKLIN H. FOWLER, JR.,** Curtiss-Wright Corp., Propeller Division, from mechanical engineer to senior structures engineer; **HOWARD J. RICHARDS,** Consolidated Freightways, Portland, Ore., from engineer in the maintenance department to draftsman.

Rambling Through Section Reports

BALTIMORE SECTION has set up an Aircraft Committee to handle the aeronautical activities of the Section. Serving on the Committee, which is headed by Section Vice-Chairman Herman Hollerith, Jr., Glenn L. Martin Co., are: J. D. Robinson, same company; Gene H. White, Adel Precision Products Corp.; B. R. Fenwick, White Engineering Co.; George Logan, British Overseas Airways; and E. R. Harrall, Friez Instrument Division, Bendix Aviation Corp.

Topic that evoked the most enthusiasm at **CINCINNATI SECTION'S** Nov. 28 meeting was Guest Speaker Robert Cass' discussion of transmission line units in present and post-war automotive equipment. . . . The 110 persons attending wanted to hear what Mr. Cass, who is chief engineer, White Motor Co., predicted about powerplants and rear axles, but his slides and commentary on transmission types and their uses in heavy-duty vehicles "hit the spot" . . . He recommended the hydraulic fluid flywheel and torque converter unit as the most efficient; urged the need for further development of the automatic transmission . . .

The real post-war problem to confront automotive engineers and manufacturers will be to combine new improvements with lower production costs, according to A. T. Colwell, vice-president, Thompson Products, Inc., who presented to the **INDIANA SECTION** Dec. 14 one of the clearest statements of what to expect in the future . . . Economy will have to be the keyword after hostilities, he declared . . . We will use only secondary amounts of aluminum, and no chrome or nickel whatever; we shall probably employ fuel injection; pressure cooling is coming as well as sealed powerplants and water injection . . . Such were Mr. Colwell's observations as well as his warning that "cars with improvements must be engineered back to where they can be sold for less" . . .

More than 400 members and their guests, including several high-ranking Army and Navy officers, attended the Jan. 4 Aircraft Meeting of the **METROPOLITAN SECTION** when Peyton Magruder, Glenn L. Martin Co., put together a case for post-war flying boats in intercontinental transport . . . Before the discussion was over, when his thesis was taken apart for closer inspection by William C. Lawrence, American Export Airlines, Inc., Capt. George A. Doole, Pan American Airways, Inc., and others, the speaker admitted that the sailing was rough . . . Jack Charshafian, vice-chairman, presided . . .

Transportation and Maintenance meeting of NORTHERN **CALIFORNIA SECTION** held Dec. 11, at which J. T. Ronan, Shell Oil Co., analyzed motor oil performance for the 75 members and guests present . . . His suggestions of useful engine procedure for evaluating motor oil quality were the result of extensive research on the subject . . . Session's technical chairman was Grant Wheeler, Associated Oil Co. . . .

Triple feature at **PEORIA SECTION'S** Dec. 29 "member" meeting (open only to speakers and audience who are members as well as invited guests) included . . . Discussion on the Civil Air Patrol in Wartime by C. M. Hewitt, professor of mechanical engineering, Bradley College, who pointed out that only Russia and the United States have allowed civilians to fly during the war, and described the many heroic deeds and sacrifices made by C.A.P. pilots . . . Talk on Design As Related to Field Service by D. O. Nash, general service manager, Caterpillar Tractor Co., who mentioned durability, simplicity, accessibility, adjustments and tool requirements as five factors to consider in products of new design . . . Presentation by R. C. Williams, research staff engineer,

Caterpillar Tractor Co., of the points which dictate field demand for dirt-moving equipment, given as: economic factors; changing markets which require opening new territory; personnel angles; competitive and allied developments. . .

The trend toward thin bearing layers has proved successful in modern internal-combustion engines because such materials as thin layers of lead or tin are continuously self-annealed at operating temperatures, which allows them to maintain their plasticity in use . . . This information was supplied at **PITTSBURGH SECTION** meeting Nov. 28 by Ralph A. Schaefer, Cleveland Graphite Bronze Co., who disclosed also that the silver bearing is the first plated bearing to achieve commercial success, and it, together with the overlay of lead and indium, is now the highest duty bearing in the field . . . The ideal thickness for tin or lead base bearing materials is approximately 0.001 in., although he cautioned that for heavy-duty applications a larger safety factor is required to prevent the danger of wearing through this thin layer and scoring the shaft . . .

Point made in lively discussion which followed the paper was that when tin base bearings are fitted too tightly, the tin melts and flows slightly to allow space for lubricant, as in the burning-in process of fitting bearings formerly used in World War I . . .

Combined night club, bingo party, beer bust, and barn-raising that was the dignified **ST. LOUIS SECTION** meeting Dec. 12 the Forrest Park Ballroom proved profita event for Section Chairman George Dav who drew his own door-prize ticket out a hat . . .

Post-war bus design, as seen by L. Fageol, Twin Coach Co., must per amortization within 8-10 years, absorb n mal operating costs, offset taxes, and co increased labor costs; all of which can accomplished under ceiling fares . . . T speaker told the gathering of 150 persons **SOUTHERN CALIFORNIA SECTIO** meeting Dec. 14 that gasoline engines w be preferred over the diesel type . . . flu two-way torque-reacting transmission w be the best selection for post-war applic tion . . . leverages may be incorporated provide constant ride characteristics . . . keep costs down, lighter materials will used in construction . . . H. E. Jordan, L Angeles Railway Corp., supervised the p gram, to which he added several facts a figures concerning the city bus transport tion . . .

Smoker held by San Diego Group of C. Section consisted of: (1) sound film Sikorsky helicopter which showed hig lights of various flights demonstrating precision control during landing and tak off . . . (2) discussion of helicopters Glen McPherren, Consolidated Vultee Ai craft Corp., and Gilbert Magill, Roto Craft Corp., who described four types helicopters as Sikorsky type, with a sing rotor for lift; the lateral type, with tw rotors attached to booms on either side the fuselage; the coaxial type, with tw rotors mounted on the same shaft, turnin in opposite directions; and the tandem typ with two rotors, mounted one forward an one aft above the fuselage . . . (3) pan discussion, which was mainly concern with problems of control . . . Earl Prudde Ryan Aeronautical Co., as master of cere monies, and sandwiches, doughnuts an coffee as refreshments, added social touc to a stimulating meeting . . .

Discussions, demonstrations and movie were all a part of **SOUTHERN NEW ENGLAND SECTION** meeting Dec. which a total of 250 attended . . . Firs John Tyler, Pratt & Whitney Aircraft Corp described the P&W accessory vibration tes ing machine . . . Then, Milton Kalische and George McCloy, Westinghouse Elec tric & Mfg. Co., exhibited experiments liquid air and freon, a gas used as a refrig erant, which showed gas to be non-inflam mable, non-toxic and heavier than air . . Roland B. Bourne, Maxim Silencer Co., gav an illustrated talk on high-speed photog raphy of waves in air with the Schlieren Method, a particularly sensitive method used to test spherical mirrors such as are used in telescopes . . . Last, film entitled "The A-B-C of Electronics at Work," ex plained the six basic ways in which elec tronic tubes function . . .

Army and Navy were well represented a **SOUTHERN OHIO SECTION** meeting Dec. 15, with Rear-Admiral A. C. Miles, Bureau of Aeronautics, reporting his recen experiences in the Pacific Theater of war and Col. Clyde H. Mitchell, Section vice chairman, presenting a paper on the de velopment of aircraft during wartime . . The colonel, who is chief of the aircraf subsection, production section of the Pro curement Division, Wright Field, brought two films with him: one dealing with fligh characteristics of the P51-B airplane, and the other, "Ramrod to Emden," showing preparations necessary for a bombing mis sion with pursuit escort . . .